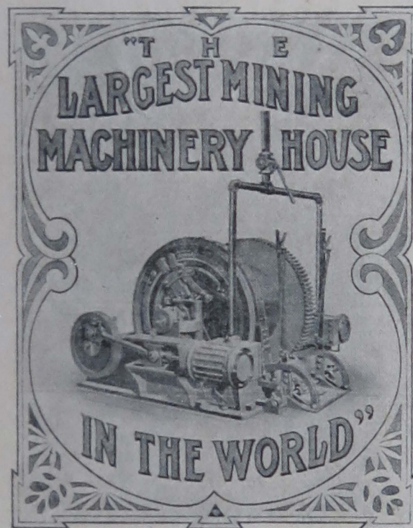


circa 1905 to 1910

Bulletin No. 15.

Mine Equipments.



The Mine & Smelter Supply Company.

DENVER, COLORADO.

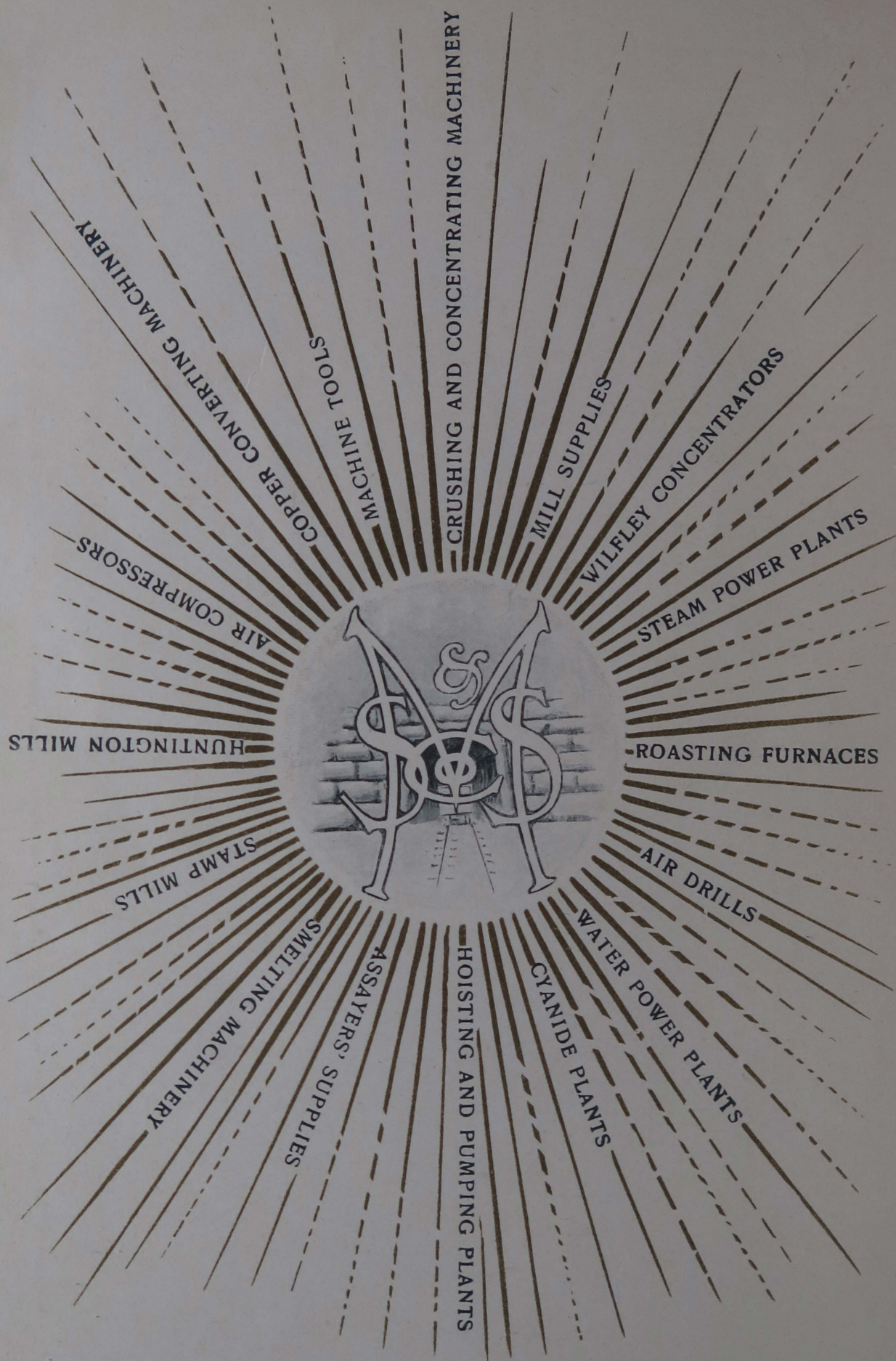
Salt Lake City, Utah.

El Paso, Texas.

42 Broadway, New York City.

The Mexico Mine & Smelter Supply Company.

City of Mexico, Mexico.



TO THE MINING PUBLIC:

The following pages illustrate and briefly describe the most important and approved machinery used in mining. We furnish all the machinery mentioned and will be pleased to submit estimates and specifications to parties contemplating installations.

We have in our employ experienced engineers whose services are always at the command of our customers. We are in a position to offer reasonable prices for machinery of the most approved design and superior workmanship, and can assure prompt delivery.

THE MINE AND SMELTER SUPPLY COMPANY.

Denver, Colorado.

HORSE WHIMS.

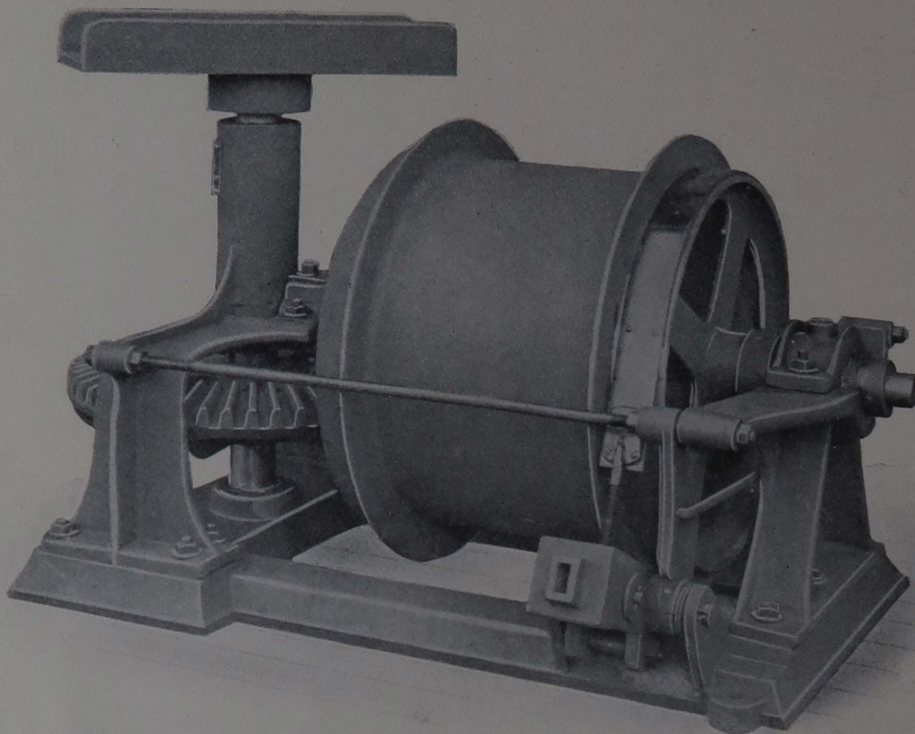


FIG. 1—15.

The Safety Brake Horse-Power Hoisting Whim, (Fig. 1), is made entirely of iron and steel. It is not affected by exposure to wet or dry climates. It is the lowest priced—most durable—safest whim on the market.

With this whim, in order to lower the load, the brake must be released by forcing the hand lever toward the drum. This lever, thrown in an opposite direction, throws into play the clutch engaging the drum for hoisting. Unless the brake be released by throwing the lever, any tendency of the load to lower or drop is instantly stopped, the automatic brake catching the drum with a firm grip and holding it until released by throwing the lever, as stated above.

The Hoisting Drum is completely under the control of the operator at the shaft, and both the hoisting and release of brake for lowering are regulated by one lever. The operation is so simple that it can be readily handled by any miner or person inexperienced in the use of machinery.

The bevel gear on the drum shaft is loose, and, in hoisting, drives the drum through a friction clutch. This avoids the frequent accidents occurring with other machines occasioned by the breaking of the gear-teeth when throwing them in and out of gear. The friction clutch is very simple and powerful in design and can be perfectly adjusted by screwing up the nuts on two rods.

As the drum is driven by a friction clutch, the operations of hoisting, dumping the bucket and lowering can be performed with the horse in constant motion, a feature that greatly increases the capacity of the machine by avoiding the loss of time due to stopping and starting the horse. It is a very light and compact machine, and can easily be taken to pieces for transportation by mules.

We carry in stock the following sizes:

Number	Capacity One Horse	Feet Hoisted per Minute	Weight
1	800 lbs	75	1500
2	500 "	125	1500
3	1000 "	60	1600
4	1500 "	45	1600
5	2000 "	30	1700

Geared Hoisting
Engines

ANACONDA PROSPECTING HOIST.

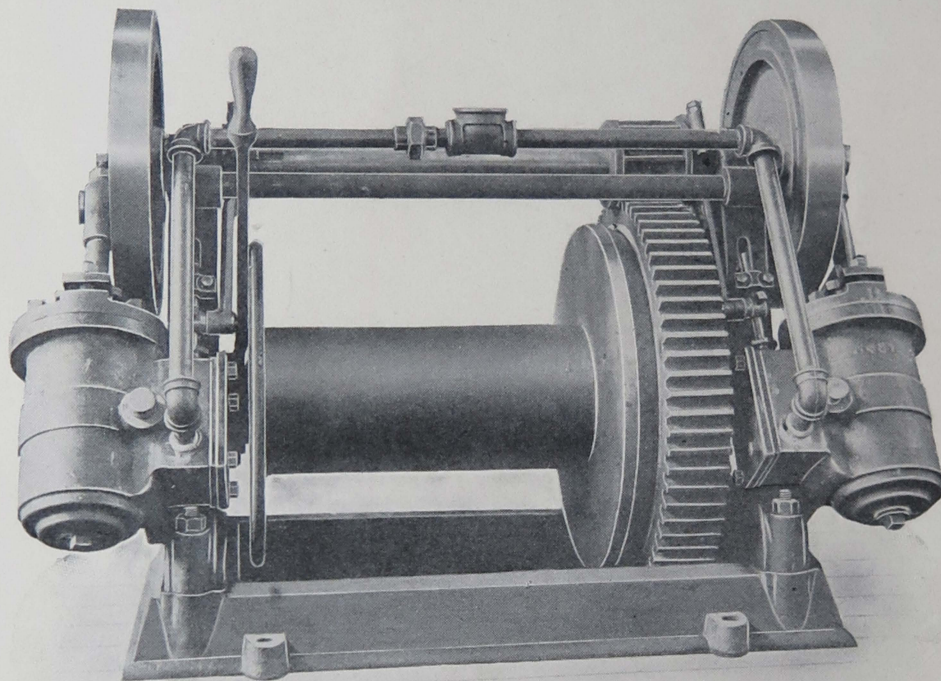


FIG. 2—15.

This type of Hoist, (Fig. 2), is much used. It is specially adapted for developing prospects and for inside work of large mines.

It is made in one size only, having cylinders $5\frac{1}{4}$ inches diameter by 5 inches stroke. Capacity of drum 1,100 feet of $\frac{1}{2}$ -inch rope. Load 1,400 pounds. Speed 100 feet per minute. 10-horse power. Weight of hoist, 1,220 pounds.

WINZE HOISTING ENGINE.

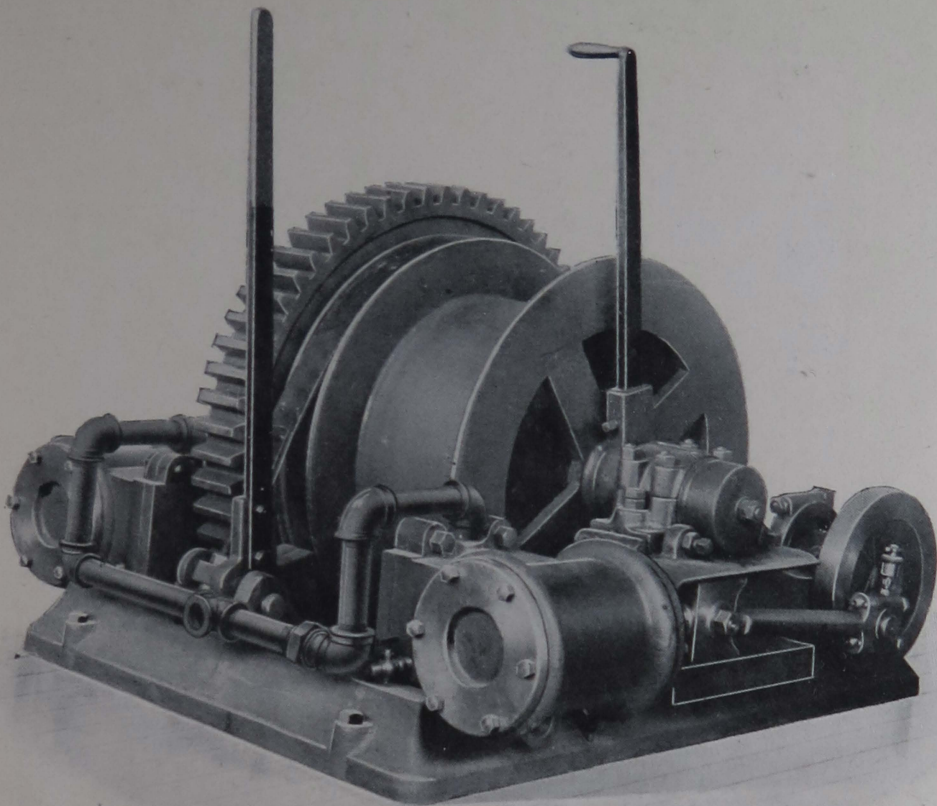


FIG. 3—15.

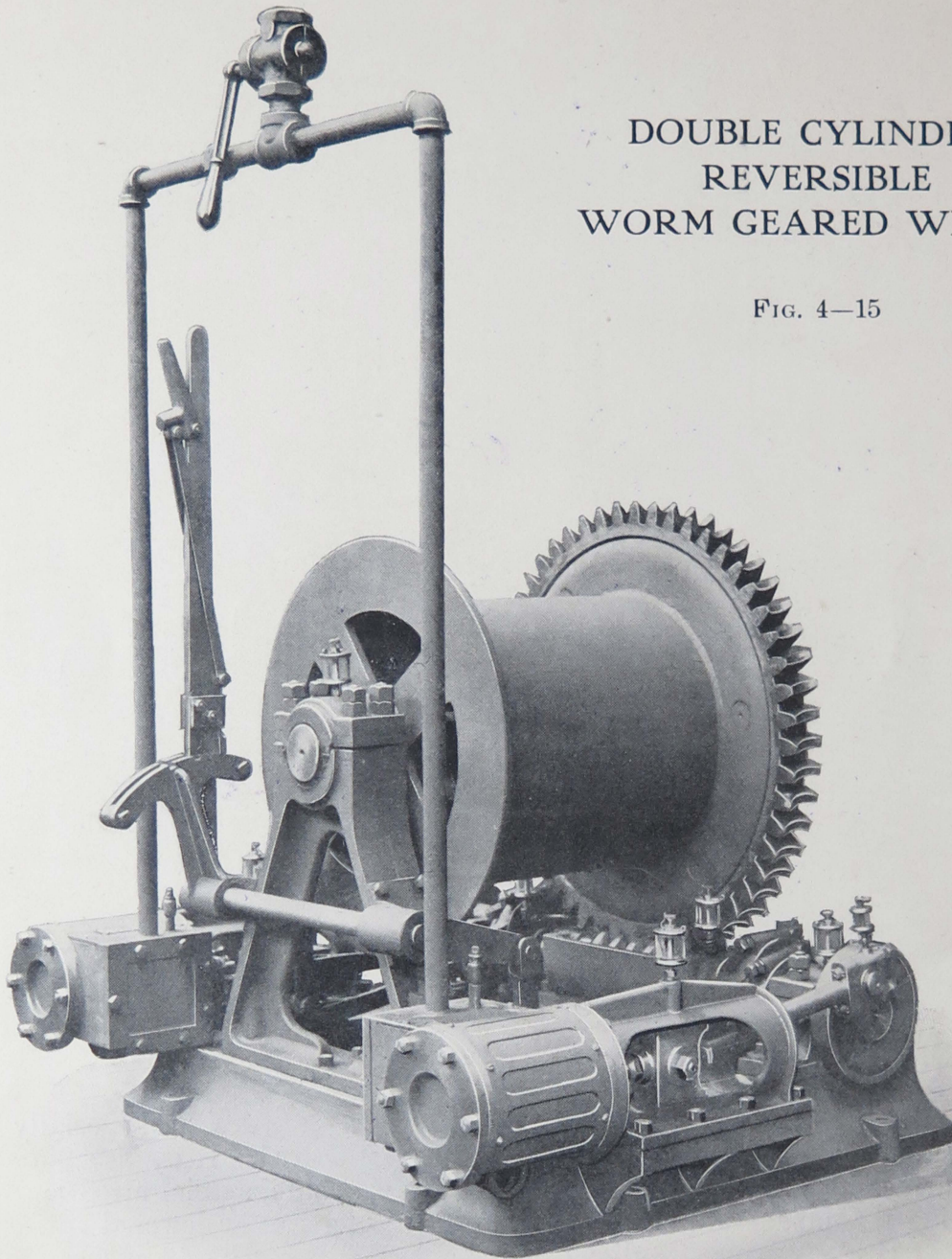
The Double Cylinder Geared Hoisting Engine, (Fig. 3), is designed specially for winze work and other underground work where space is limited. It is, also, suitable for a small surface hoisting plant. In designing this machine, special attention was given to making it compact and substantial. This hoister can be lowered entire on a cage in a 4x4 shaft, the outside dimensions being 42 inches by 44 inches. The height over the gear is 32 inches. The cylinders and bed are of our usual well-known type. The bed is split in two parts and, when desired, can be taken apart, which will allow the machine to be taken through an opening 24 inches by 30 inches.

The gears are cut from solid blanks of cast iron. The large gear is loose on the drum shaft, being provided with a phosphor bronze bushing to take the wear. On the drum side of the gear is a turned V-shaped surface which engages with a V groove turned in a ring of wood blocks, secured to the drum under the brake seat. The drum is forced against the friction surface by means of a quick pitch screw. The thrust of the screw is self-contained, thus relieving the frame from side strain. The brake is of the differential type and holds the load automatically. The cylinders are 5 inches in diameter, 6-inch stroke. Hoisting speed 250 feet per minute. Load hoisted 1,200 pounds. Shipping weight 1,500 pounds. Large gear, 30 inches by 31½ inches. Pinion, 5½ inches by 3½ inches. Drum, 18 inches diameter, 11 inches long. Piping, 1 inch.

With each Engine we furnish Oil Cups, Sight Feed Lubricator, Throttle, Drip Cocks, Pipe and Fittings as shown in illustration; also, the necessary Tees, Elbows and Unions for the exhaust and a set of Foundation Bolts and Washers.

DOUBLE CYLINDER REVERSIBLE WORM GEARED WINCH

FIG. 4-15



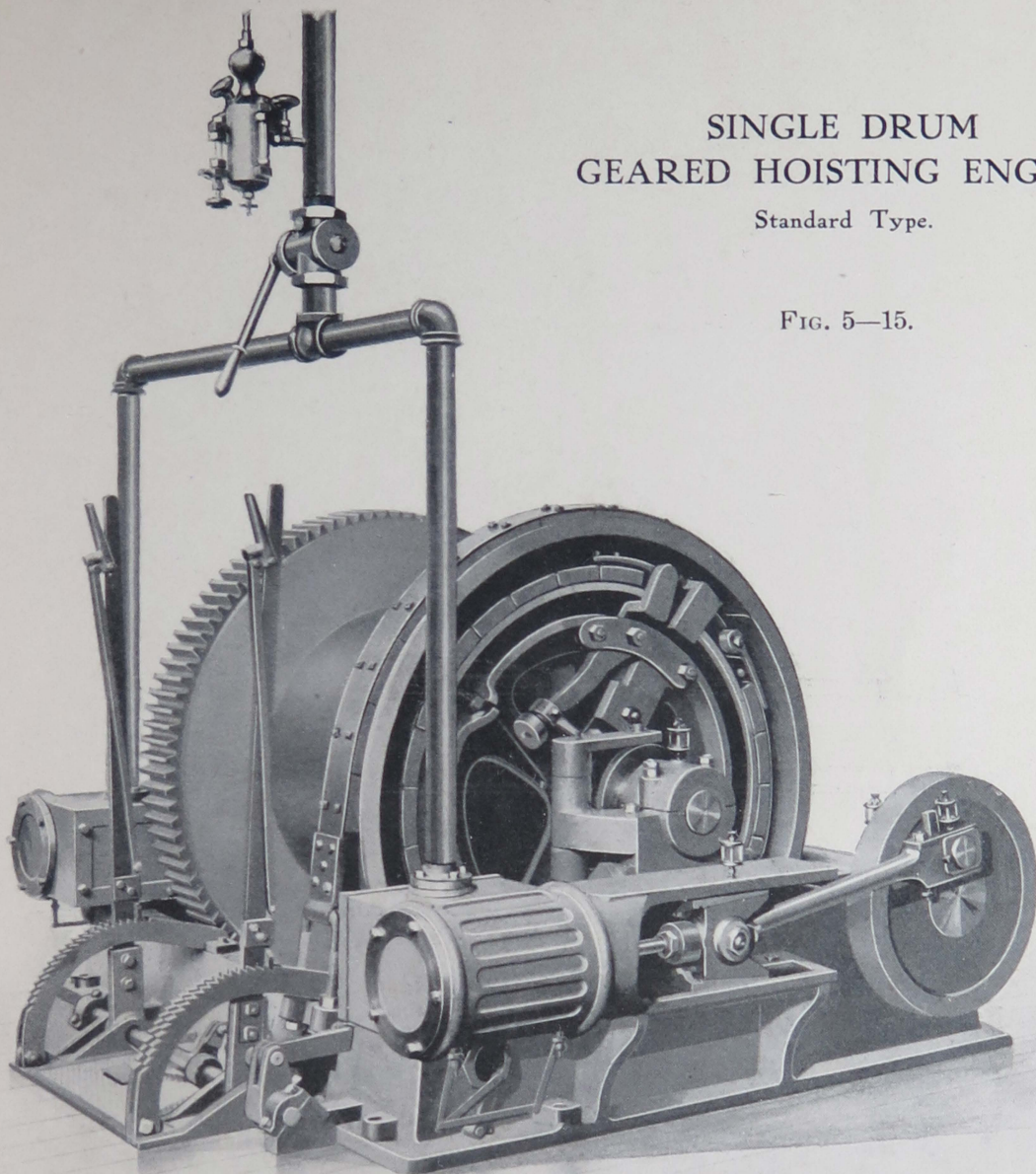
Our Worm Geared Winch, (Fig. 4), has been designed for the most severe service in handling heavy pumps, columns, timbers, etc. To avoid all possibility of accident, the worm gear is secured directly to the drum and the engines are provided with reversing gear for lowering, doing away with all clutches and brakes. The worm wheels have machine-cut teeth and the worms are turned from solid phosphor bronze castings. The worm runs in an oil box and its end thrust is taken up by bronze and steel anti-friction washers.

	No. 1	No. 2
Size Cylinders, inches	5 x 6	6 x 8
Horse Power, usual rating	12	20
Usual Speed of Hoisting, feet per minute	25	25
Diameter Drum, inches	18	30
Load Hoisted, pounds	10000	20000
Weight, pounds	2500	7000

SINGLE DRUM GEARED HOISTING ENGINE.

Standard Type.

FIG. 5—15.



The Geared Hoisting Engines, (Fig. 5), were designed to meet the demand for a high grade and economical hoisting engine. In their designing, special attention was given to making them rigid, durable and simple. The gears are cut from solid blanks of cast iron, by special gear-cutting machines, making the best and most quiet running cut gear obtainable. The drum is loose on the shaft, on which it is carried by removable phosphor bronze bushings. It is driven by a very simple and powerful clutch of the brake band type which is easily adjustable. The friction surfaces on both clutch and brake bands are of white wood and are easily renewed when worn. We furnish these hoists with Reversible Link Motion, when desired.

CYLINDERS.		Hoisting Speed-Ft. per Min.	Load Hoisted, Pounds	Shipping Weight, Pounds	GEARING			DRUM		PIPING	
Diam., In.	Stroke, In.				Large, In.	Small, In.	Face, In.	Diam., In.	Length, In.	Steam, In.	Exhaust, In.
6½	8	300	2300	4500	40	8	5	26	20	2	2
8½	10	400	4500	7000	48	9	6	32	24	2½	2½
10	14	500	5800	15000	66	12	10	48	36	3½	3½
12	14	550	9000	16000	66	12	10	54	36	3½	3½

With each Engine we furnish Oil Cups, Sight Feed Lubricator, Throttle, Drip Cocks, Pipe and Fittings as shown in illustration; also, the necessary Tees, Elbows, and Unions for the Exhaust, and a set of Foundation Bolts and Washers. Indicators of dial or horizontal screw type can be supplied. When desired, attachments can be furnished by which the hoist can be handled from the shaft.

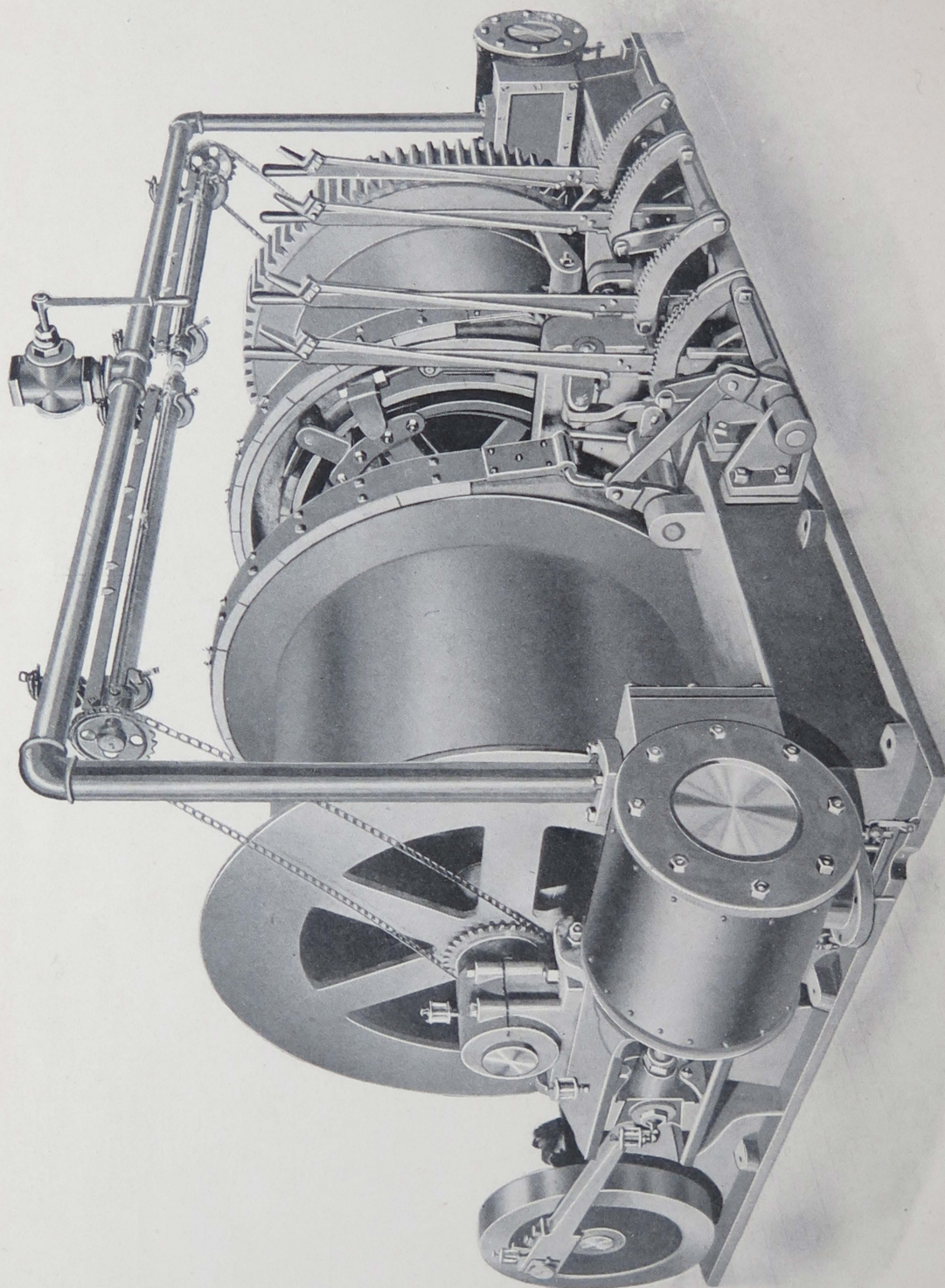


FIG. 6-15.

DOUBLE DRUM GEARED HOISTING ENGINE.

Standard Type.

DOUBLE DRUM GEARED HOISTING ENGINE.

Standard Type.

Fig. 6 shows our Standard Double Drum Geared Hoisting Engine, which we make in all sizes listed for our single drum engines. The engines of the single and double drum types are identical in construction. All beds of the double drum machine are made extra heavy and strong, and are tied together at the center by heavy sole plates which support the center bearing of the drums. The crank shafts and other parts are of the standard dimensions as found most satisfactory by our years of experience in the construction of single drum engines. The drums are mounted on phosphor bronze removable bushings, as in the single drum engine and the engines are finished in the same general manner. We furnish these hoists with Reversible Link Motion, when desired.

CYLINDERS		Hoisting Speed— Feet per Minute	Load Hoisted, Lbs.	SHIPPING WEIGHT		GEARING			DRUM		PIPING	
Diam., In.	Stroke, In.			Plain	Rever- sible	Large, In.	Small, In.	Face, In.	Diam., In.	Length In.	Steam, In.	Exhaust. In.
6½	8	300	2300	7500	8000	40	8	5	26	20	2	2
8½	10	400	4500	11000	11600	48	9	6	32	24	2½	2½
10	14	500	5800	24000	25200	66	12	10	48	36	3½	3½
12	14	550	9000	26000	27500	66	12	10	54	36	3½	3½

With each Engine we furnish Oil Cups, Sight Feed Lubricator, Throttle, Drip Cocks, Pipe and Fittings, as shown in illustration; also, the necessary Tees, Elbows and Unions for the Exhaust, and a set of Foundation Bolts and Washers. Indicators of the dial or horizontal screw type can be supplied at short notice.

Complete Equipments
for
Mine, Mill, Smelter.

MACHINERY.

HOISTING	DRILLING	TRAMMING
CRUSHING	SAMPLING	IRONWORKING
AMALGAMATING	PUMPING	IRRIGATING
CONCENTRATING	SMELTING	TRAMWAYS
CYANIDE	CONVERTING	CONCENTRATORS
ROASTING	WOODWORKING	QUARRYING

POWER.

STEAM	AIR	GASOLINE ENGINES
WATER	ELECTRIC	

SUPPLIES.

ASSAYERS'	WATER FITTINGS	BLACKSMITHS' TOOLS
CHEMISTS'	CONTRACTORS' TOOLS	BELTING
STEAM FITTINGS	MACHINISTS' TOOLS	HOSE
PIPE	RAILS	ORE CARS

First Motion Hoisting
Engines

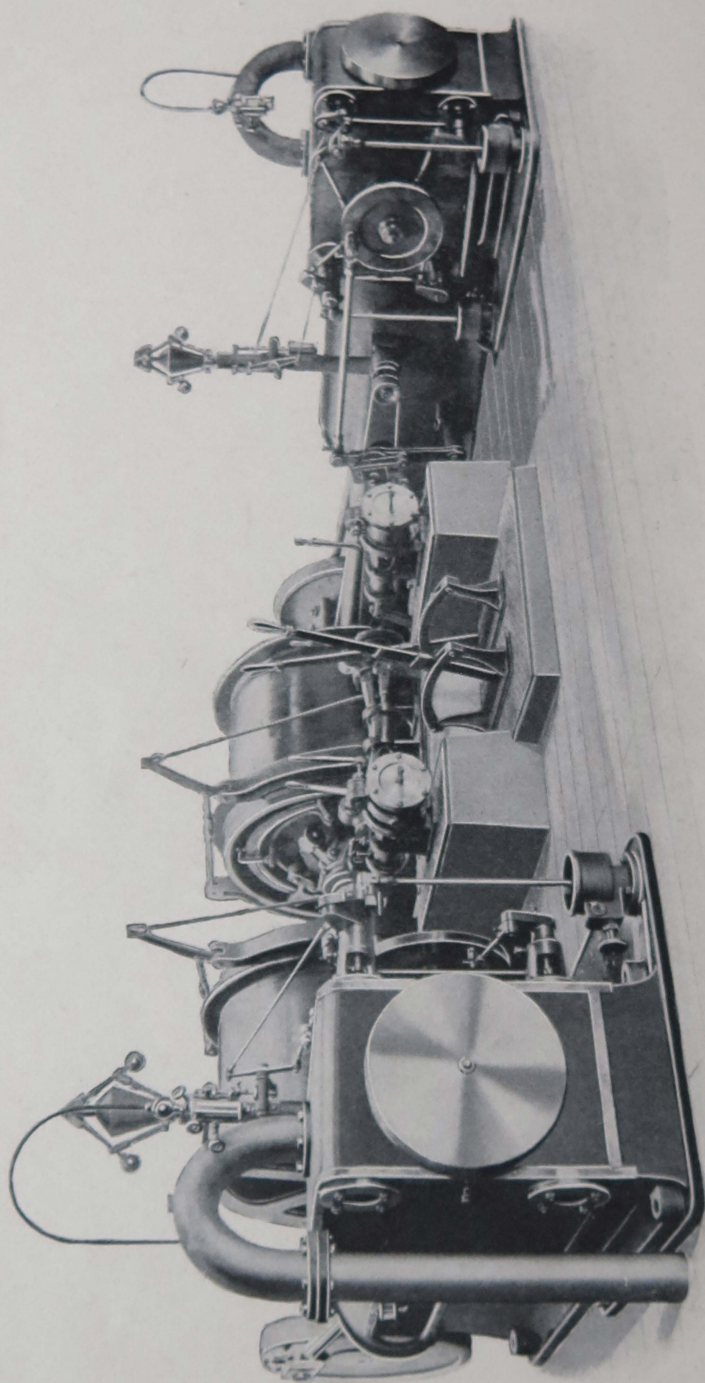


FIG. 7-15.

FIRST MOTION DOUBLE DRUM CORLISS HOISTING ENGINE.

FIRST MOTION DOUBLE DRUM CORLISS
HOISTING ENGINE.

Fig. 7 illustrates a class of hoisting engines we are furnishing for some of the large copper properties in Arizona.

In the figure, the steam brake mechanism is shown mounted on blocks, in sight; it is, usually, placed beneath the floor.

We build this type of hoisting engine of any size required and with single or double drums.

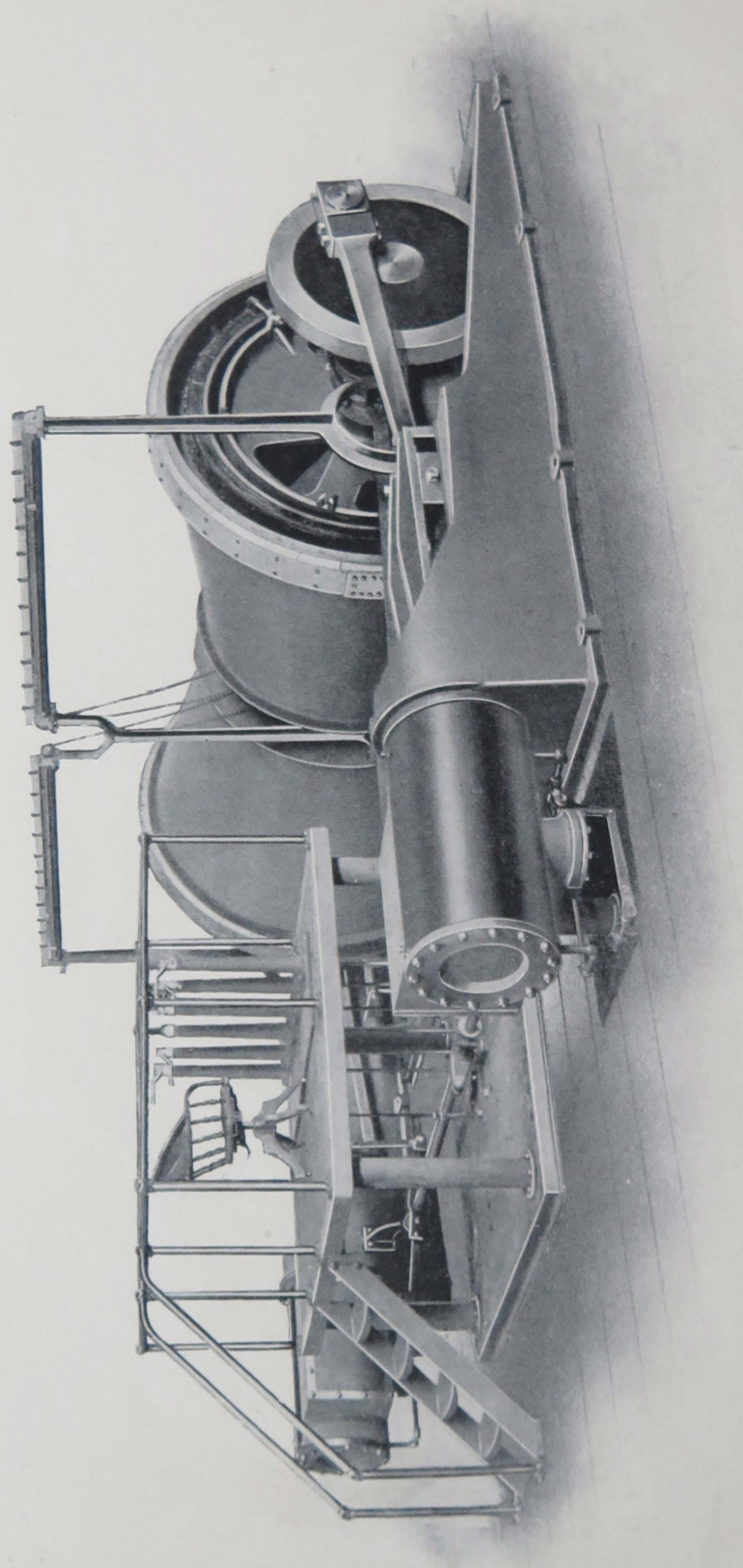


FIG. 8-15.
FIRST MOTION DOUBLE CONICAL DRUM SLIDE VALVE HOISTING ENGINE.

FIRST MOTION DOUBLE CONICAL DRUM SLIDE VALVE HOISTING ENGINE.

Fig. 8 shows the type of hoisting engine we built for the Golden Cycle mine at Victor, the Resurrection No. 2 at Leadville, and, with single drum, for the Granite mine at Victor. It is a direct connected engine with cylinders 18-inch bore by 36-inch stroke, and is provided with two drums for round rope. The drums run loose on the main shaft and are provided with removable phosphor bronze bushings which can be readily replaced when worn. The drums are driven by powerful clutches of the brake band type, and are controlled, when lowering, by powerful strap brakes.

The engines are provided with link motion reversing gear, which allows the cages to run in balance, and which allows the use of an early cut-off of steam in the cylinders, giving a very economical use of steam. The engines are controlled by small levers at the engineer's footplate, through which water under pressure operates the various clutches, brakes and reverse gear.

This hoist is, also, built with levers to be operated by either steam or hand power.

This machine handles a total load of 10,000 pounds from a depth of 2,000 feet at a speed of 3,000 feet per minute.

We build this type of hoisting engine of any size required and with single or double drums.

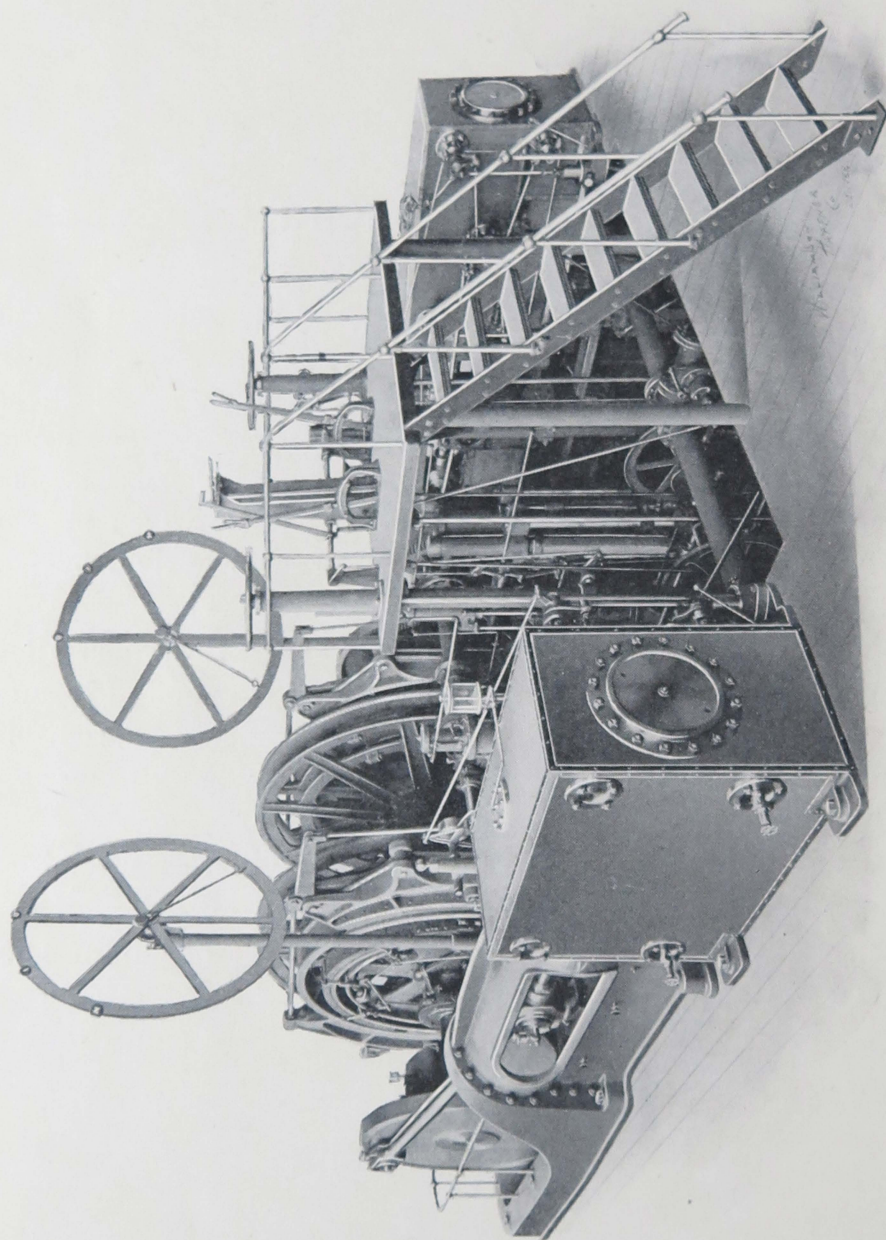


FIG. 9-15.

THE BULLOCK DOUBLE REEL CORLISS HOISTING ENGINE.

TABLE OF THE BULLOCK DOUBLE REEL HOISTING ENGINES

First Motion.

With Corliss or Slide Valve Engines.

REELS				ROPE Inches	ENGINES			Shipping Weight, Pounds
Diam. of Center, Inches	Diam. of Arms, Feet	Width, Inches	Cap., Feet of Rope		80 Lbs. Boiler Pres., Dia. x Stroke, Inches	Revs. per Min.	Load from Max. Depth Excl. Rope Pounds	
36	8	3½	800	¾x3	16x42	85	5,200	60,000
36	9	4	1,000	¾x3½	18x42	85	6,000	65,000
36	9	4½	1,200	¾x4	20x42	85	7,000	66,000
42	9	4	1,000	¾x3½	18x42	85	6,300	89,000
42	10	4½	1,200	¾x4	20x42	85	7,300	91,000
42	12	5	1,400	¾x4½	20x48	75	7,900	107,000
48	9	4½	1,000	¾x4	16x42	85	5,700	80,000
48	9	4½	1,000	¾x4	20x42	85	7,800	92,000
48	10	5	1,500	¾x4½	20x48	75	8,000	108,000
48	12	5½	2,200	¾x5	20x60	60	9,000	136,000
54	12	5	2,000	¾x4½	20x48	75	8,100	117,000
54	13	5½	2,500	¾x5	20x60	60	9,300	139,000
54	14	5	2,500	½x4½	24x48	75	9,600	147,000
54	14	5½	3,000	¾x5	24x60	60	11,400	157,000
54	15	5½	3,000	½x5	26x60	60	12,500	189,000
60	13	6	2,500	¾x5½	20x60	60	10,400	142,000
60	14	5	2,500	½x4½	22x60	60	10,000	158,000
60	15	5½	3,000	½x5	24x60	60	11,600	163,000
60	16	6	3,500	½x5½	28x60	60	14,000	198,000
60	18	6½	4,000	½x6	32x60	60	16,000	238,000

The above loads are only approximate and are figured for average weights of skip or cage and car when hoisting in balance. Every hoist as a rule presents some feature that makes special calculations necessary in order to obtain the best results.

Prices include Sole-Plates under Engines, Foundation Bolts and Washers, Steam Piping, Throttle Valves, Lubricators, Oil Cups and everything necessary for a complete hoist.

All the hoists, except the 3-feet reels, have steam-actuated post brakes. The clutches are moved by steam or hand power. The larger reels have foot brakes on the crank disks and steam-actuated reverse mechanism. We supply either dial indicators or drum indicators.

ELECTRIC PROSPECTING HOIST.

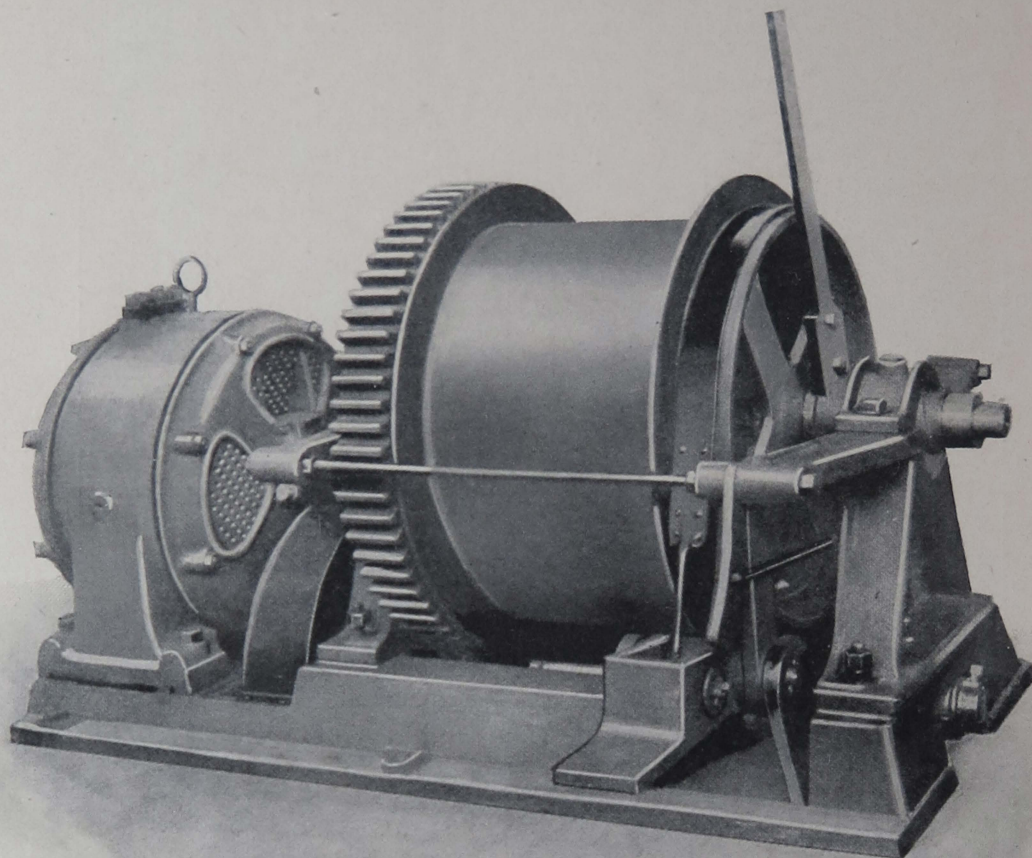


FIG. 10—15.

Fig. 10 shows our 5-horse power Electric Prospecting Hoist, a machine specially suitable for prospecting and winze work. Particular attention was given in its design to make it very compact and simple, so that it can readily be moved from place to place.

The drum, clutch and brake are similar to those used in our horse whim, illustrated on page 2.

The brake band is of the differential self-acting type, which makes it impossible to lower or drop the load unless the brake is purposely held off its seat by means of the controlling lever. The motor on this small hoist is not provided with a controller, but is allowed to run at constant speed, the friction clutch being used when it is desired to hoist. The drum is 22 inches in diameter by 14 inches in length. The gearing is amply heavy to handle any load within the capacity of the motor.

The machine is very substantially built, and is intended to handle a maximum load of 1,000 pounds at a speed of 125 feet a minute.

ELECTRIC HOISTS.

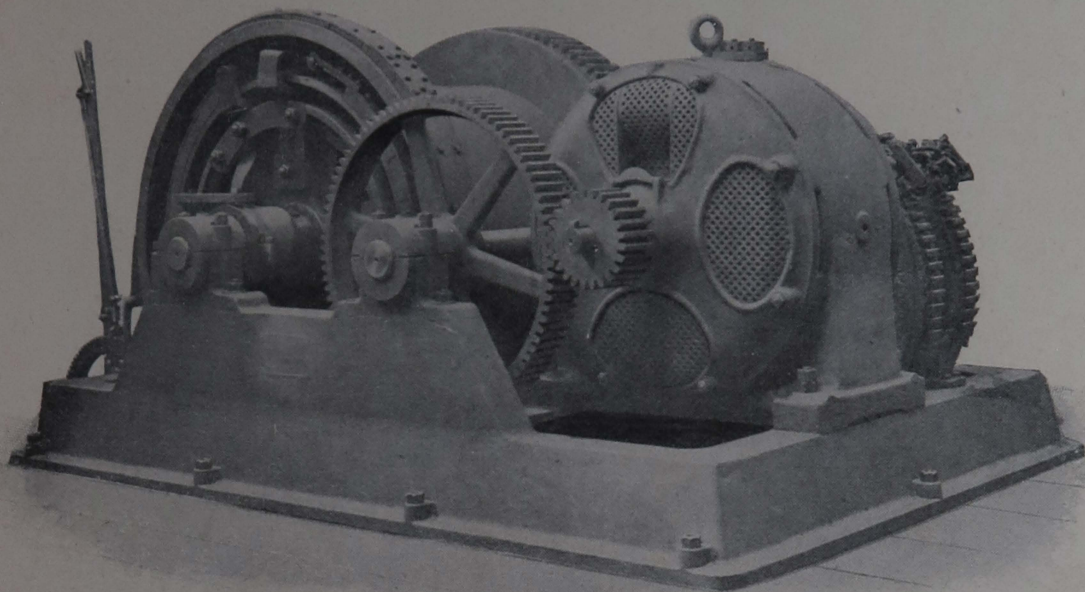


FIG. 11—15.

The above illustration represents our Electric Hoists, designed specially to meet the requirements of those desiring to avail themselves of the many advantages of electrical power.

The gearing, clutches, brakes and drums are those used with our standard steam-gear hoisting engines of equal power illustrated on page 7. The motor and controller are secured to the frame which carries the drum and levers, making a machine which is entirely self-contained.

The gears on the motor shaft are cut from the best fibre, making a very quiet and smooth-running machine. All other gears are cut from solid blanks of cast iron.

SIZES, CAPACITIES.

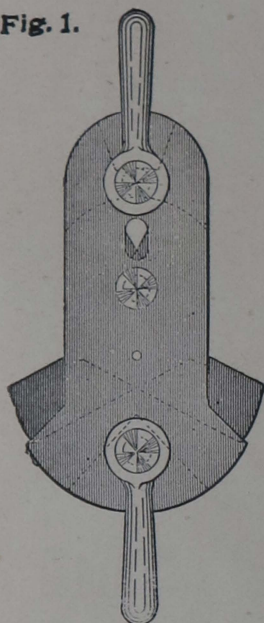
H. P.	Hoisting Speed-Ft. per Min.	Load Hoisted, Pounds	MAIN GEARING			DRUM	
			Large, In.	Small, In.	Face, In.	Diameter, In.	Length, In.
15	250	1200	43	8½	5	26	22
30	250	2500	50	9	6	36	27
75	500	4000	71.63	12.95	10	48	37

We, also, build electric hoists for all conditions and requirements.

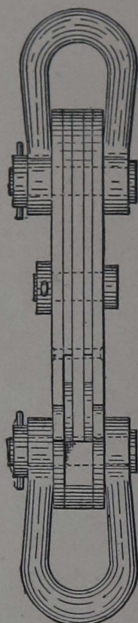
When writing for prices, mention the electrical system for which the motor is to be adapted. State voltage to be employed and whether the current is to be direct or alternating. If the latter, state the number of alternations per minute and phase.

HOISTING HOOKS.

Fig. 1.



2.



3.

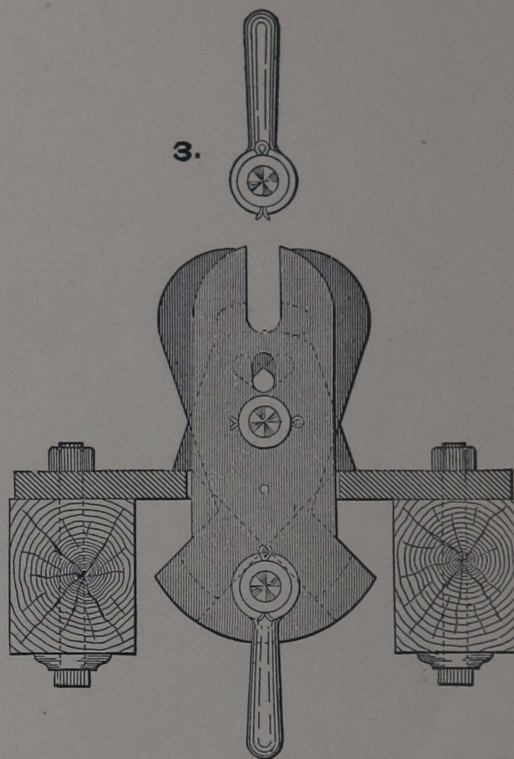


Fig. 4.

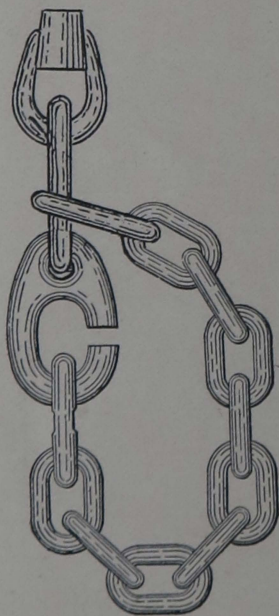
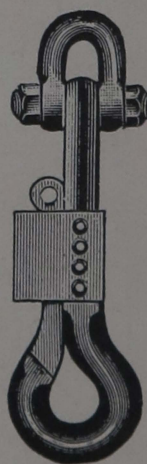


Fig. 5.



HOISTING HOOKS.

The safety hook represented in Figs. 1, 2 and 3 is designed to prevent accident due to overwinding of the hoisting rope. Fig. 1 shows the safety hook closed at the top and entering the stationary safety stop when accidentally unwinding. Fig. 2 shows edge view of the safety hook. Fig. 3 shows the hook having just passed the safety stop; the spreading plates have closed at the bottom, causing their upper parts to open like a pair of scissors, releasing the rope, and at the same time the plates spreading at the bottom drop and rest on the safety stop, suspending the cage until the rope is again attached.

When overwinding has thus occurred and the rope brought back with lifting clevis close to the hook plates, insert the long clevis sent with each hook through the lifting clevis, taking out the pin of the long clevis. Insert this pin in the cross diagonal slots passing the pin through the long clevis, then put a slight strain on the rope, when the swinging plates will immediately fall into place and the cage can be lowered to the landing dogs, when the long clevis is taken out and the lifting clevis returned to its original place.

Fig. 4 represents a safety hook and chain largely used with buckets for small hoisting engines. The link hooked into the hook can only be unfastened by turning it crosswise of the hook at a certain place. This simple construction serves every purpose of strength and safety and is recommended for light loads.

Fig. 5 shows a simple form of safety hook easily and quickly removed from a bucket or car. The latch is held in place by a heavy steel spring.

CRUCIBLE STEEL ROPE.

Hoisting.

19 Wires to the Strand—Hemp Center.

Diameter in Inches	Price per Foot	Approximate Breaking Strain in Tons of 2000 Pounds	Diameter of Hemp Rope of Equal Strength	Allowable Working Strain in Tons of 2000 Pounds	Average Weight of Rope per Foot	Minimum Size of Drum or Sheaves in Feet	Diameter in Inches	Price per Foot	Approximate Breaking Strain in Tons of 2000 Pounds	Diameter of Hemp Rope of Equal Strength	Allowable Working Strain in Tons of 2000 Pounds	Average Weight of Rope per Foot	Minimum Size of Drums or Sheaves in Feet
$\frac{1}{4}$	\$0 09	2.4	$\frac{3}{4}$	.48	0.10	$\frac{1}{2}$	1	\$0 30	34.	3	$6\frac{3}{4}$	1.58	4
$\frac{5}{16}$	09 $\frac{1}{4}$	3.4	$\frac{7}{8}$	.68	0.15	$\frac{2}{3}$	$1\frac{1}{8}$	38	42.	$3\frac{3}{8}$	$8\frac{1}{2}$	2.00	$4\frac{1}{2}$
$\frac{3}{8}$	09 $\frac{1}{2}$	5.	1	1	0.22	1	$1\frac{1}{4}$	46	50.	$3\frac{3}{4}$	10	2.50	5
$\frac{7}{16}$	10	6.8	$1\frac{1}{4}$	$1\frac{1}{4}$	0.30	$1\frac{1}{4}$	$1\frac{3}{8}$	56	62.	4	12	3.00	$5\frac{1}{2}$
$\frac{1}{2}$	11	8.8	$1\frac{1}{2}$	$1\frac{3}{4}$	0.39	$1\frac{1}{2}$	$1\frac{1}{2}$	66	72.	$4\frac{1}{4}$	$14\frac{1}{2}$	3.65	$5\frac{3}{4}$
$\frac{9}{16}$	12	11.	$1\frac{5}{8}$	$2\frac{1}{4}$	0.50	$1\frac{3}{4}$	$1\frac{5}{8}$	74	84.	$4\frac{3}{4}$	17	4.15	$6\frac{1}{4}$
$\frac{5}{8}$	14	13.6	$1\frac{3}{4}$	$2\frac{3}{4}$	0.62	2	$1\frac{3}{4}$	93	96.	$5\frac{1}{4}$	20	5.00	$7\frac{1}{4}$
$\frac{3}{4}$	18	19.4	$2\frac{1}{8}$	$3\frac{3}{4}$	0.89	3	2	1 11	124.	....	25	6.30	8
$\frac{7}{8}$	23	26.	$2\frac{5}{8}$	$5\frac{1}{4}$	1.20	$3\frac{1}{2}$	$2\frac{1}{4}$	1 42	156.	....	31	8.00	$8\frac{1}{2}$

ORE BUCKETS.



FIG. 12—15.

Style No. 1.



FIG. 13—15.

Style No. 2—With Strips on Side.

The sides and bottoms are made of steel plate and are pressed to shape in an hydraulic press. By this means we make a perfect bucket with smooth, hard and springy surface. The rivets are countersunk, and the sides are of such shape that no part can catch upon the timbering or sides of the shaft. The bottom of the bucket is dished so that the ring to which the dumping chain is attached does not interfere with the bucket standing fairly on the ground.

Number	Height	Diameter			Thickness Steel	Capacity		Weight	
		Top	Center	Bottom		Cubic Feet	Average Lbs. Ore		
1	30	21	24	17	No. 9	6 $\frac{1}{2}$	750	140	.....
2	30	21	24	17	No. 11	6 $\frac{1}{2}$	750	125	.....
3	32	24	27	21	No. 8	9	1100	195	.....
4	37	28	34	23	$\frac{1}{4}$ in.	15	1700	400	.....
5	37	24	28	22	$\frac{1}{4}$ in.	11	1300	350	.....
6	24	20	22	16	No. 14	4 $\frac{1}{2}$	550	67	Horse Whim.....
6 $\frac{1}{2}$	28	20	24	16	No. 14	6	725	75	Horse Whim.....
7	19	17	19	14	No. 16	2 $\frac{1}{2}$	300	35	Horse Whim.....
10	40	27	32	23	$\frac{1}{4}$ in.	15 $\frac{1}{2}$	1800	400	.....
11	48	26	31	22	$\frac{1}{4}$ in.	17 $\frac{1}{2}$	2100	425	.....
12	40	26	31	22	$\frac{1}{4}$ in.	14 $\frac{1}{2}$	1650	375	.....
13	42	26	31	22	$\frac{1}{4}$ in.	15	1700	385	.....
14	28	22	28	19	$\frac{3}{16}$ in.	7 $\frac{1}{2}$	900	150	.....

Styles Nos. 1 and 2 refer to form of bail.

A complete stock of all these sizes always on hand ready for immediate shipment.

Other sizes and weights made to order.

Any of the sizes given can be made of any weight of steel.

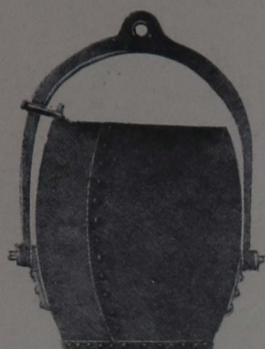


FIG. 14—15.

SELF-DUMPING BUCKETS.

No.	Height, Inches	Diameter Inside, Inches			Thick- ness Steel	Capacity, Cubic Ft.	Weight, Pounds
		Top	Center	Bottom			
15	30	21	24	17	No. 9	6½	200
16	32	24	27	21	No. 8	9	250
17	37	24	28	22	¼ in.	11	350
18	37	28	34	23	¼ in.	15	400
19	40	27	32	23	¼ in.	15½	450

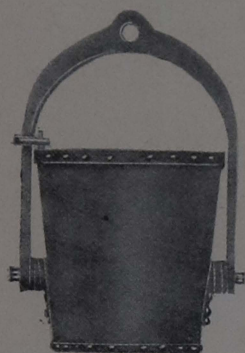


FIG. 15—15.

No.	Height, Inches	Diameter Inside, Inches		Thickness Steel	Capacity, Cubic Ft.	Weight, Pounds
		Top	Bottom			
20	30	24	17	No. 9	6½	150
21	32	28	21	No. 8	9	175
22	37	30	21	¼ in.	11	300
23	37	32	33	¼ in.	13	400
24	40	34	33	¼ in.	15	450

INCLINE BUCKETS.

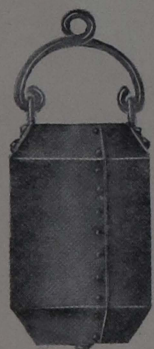


FIG. 16—15.

No.	Height,	Diameter Inside, Inches			Thick- ness Steel	Capacity, Cubic Ft.	Weight
		Top	Center	Bottom			
25	30	21	24	21	No. 9	6½	150
26	32	22	27	22	No. 8	9	200
27	37	22	27	22	¼ in.	11	300
28	37	23	28	23	¼ in.	13	350
29	40	25	30	25	¼ in.	15	400

HAND WINDLASS BUCKETS.



FIG. 17—15.

No.	Height, Inches	Diameter, Inches		Capacity, Cubic Feet	Weight, Pounds
		Top	Bottom		
8	16	16	14	1¾	28
9	15	19	14	2	28

Hand Windlass Buckets always on hand ready for shipment. Self-dumping and incline buckets are made to order.

BUCKET CARS

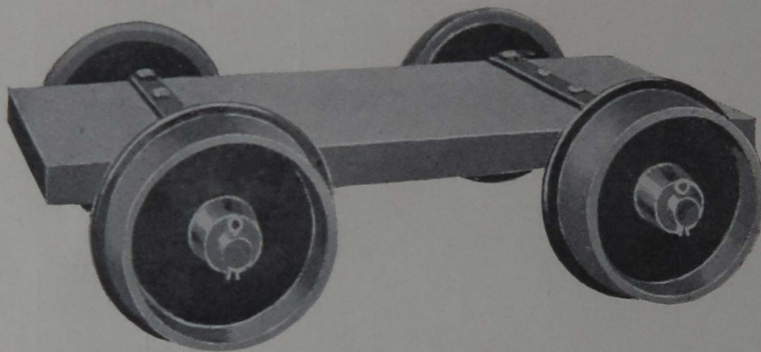


FIG. 18—15.

We manufacture a small Bucket Car, which is useful for handling buckets when no ore cars are used.



WATER BUCKETS.

FIG. 19—15.

Our Water Buckets are of the most approved pattern. Wrought-iron strips are riveted to the sides, providing wearing surface when used in incline shafts. The sides are perfectly smooth—all possibility of catching on the timbering is avoided.

The bucket has a stiff bail. A valve, opening and closing automatically, is in the bottom, as seen in Fig. 19.

Capacity, gallons.....	40	50	60	75	100	125	150	175	200	250	300	350
Length, inches.....	36	40	44	48	52	56	60	64	66	69	72	76
Diameter, middle.....	20	21	22	24	26	28	30	32	33	36	38	40
Diameter, ends....	16	17	18	19	21	23	24	25	26	28	30	32
Weight, pounds.....	100	175	220	300	350	400	520	550	700	800	850	900

Above sizes of water buckets carried in stock, and orders filled and shipped without delay.

AUTOMATIC BAILING TANKS.

These steel tanks are arranged to run in cage guides and fill and empty automatically. When lowered into the sump the valve opens and the tank fills with water. When raised to where the water is to be discharged, rollers on the bell-crank arms engage with an incline guide, throwing them out and opening the side valve. A very large quantity of water can be handled by these tanks at much smaller expense than by pumps. They are built to order to suit guides.

Capacity, Gallons	Approximate Weight	Capacity, Gallons	Approximate Weight
150	600	500	1400
200	700	600	1600
250	800	700	1900
300	875	800	2200
350	950	1000	2700
400	1100	1200	3200

ORE AND WATER SKIPS.

For Incline Shafts.

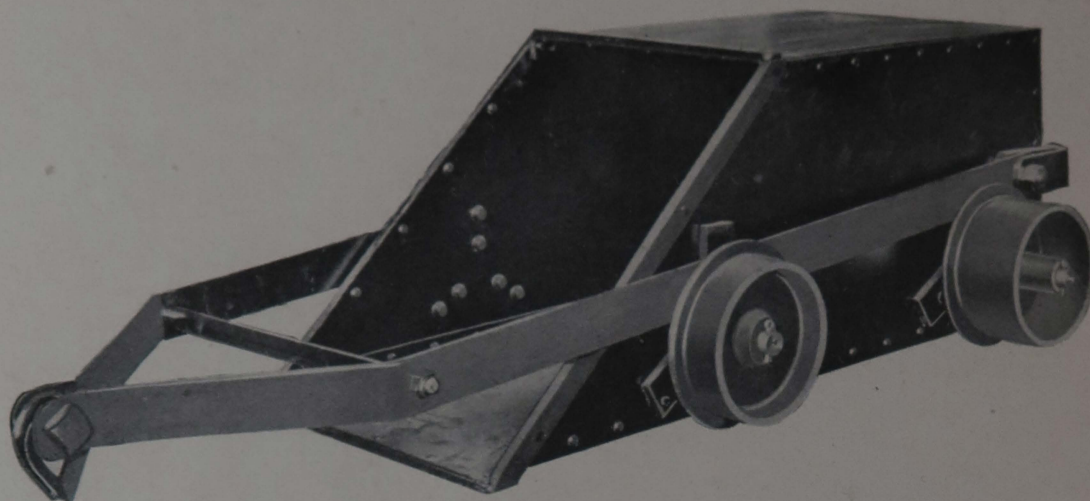


FIG. 20—15.

Capacity of Skip in Cubic Feet	Thickness of Steel in Box, Inches	Weight, Approximate Pounds	Capacity of Skip in Cubic Feet	Thickness of Steel in Box, Inches	Weight, Approximate Pounds
10	$\frac{3}{16}$	550	25	$\frac{1}{4}$	1300
15	$\frac{1}{4}$	800	30	$\frac{1}{4}$	1600
20	$\frac{1}{4}$	1050			

When skips are used for hoisting water a valve is placed in the bottom, which opens automatically for receiving the load.

Our skips are built entirely of Norway iron and steel plate, and the wheels are of best chilled iron.

We do not carry skips in stock, as they are made to fit the incline, but we furnish them of any size or style.

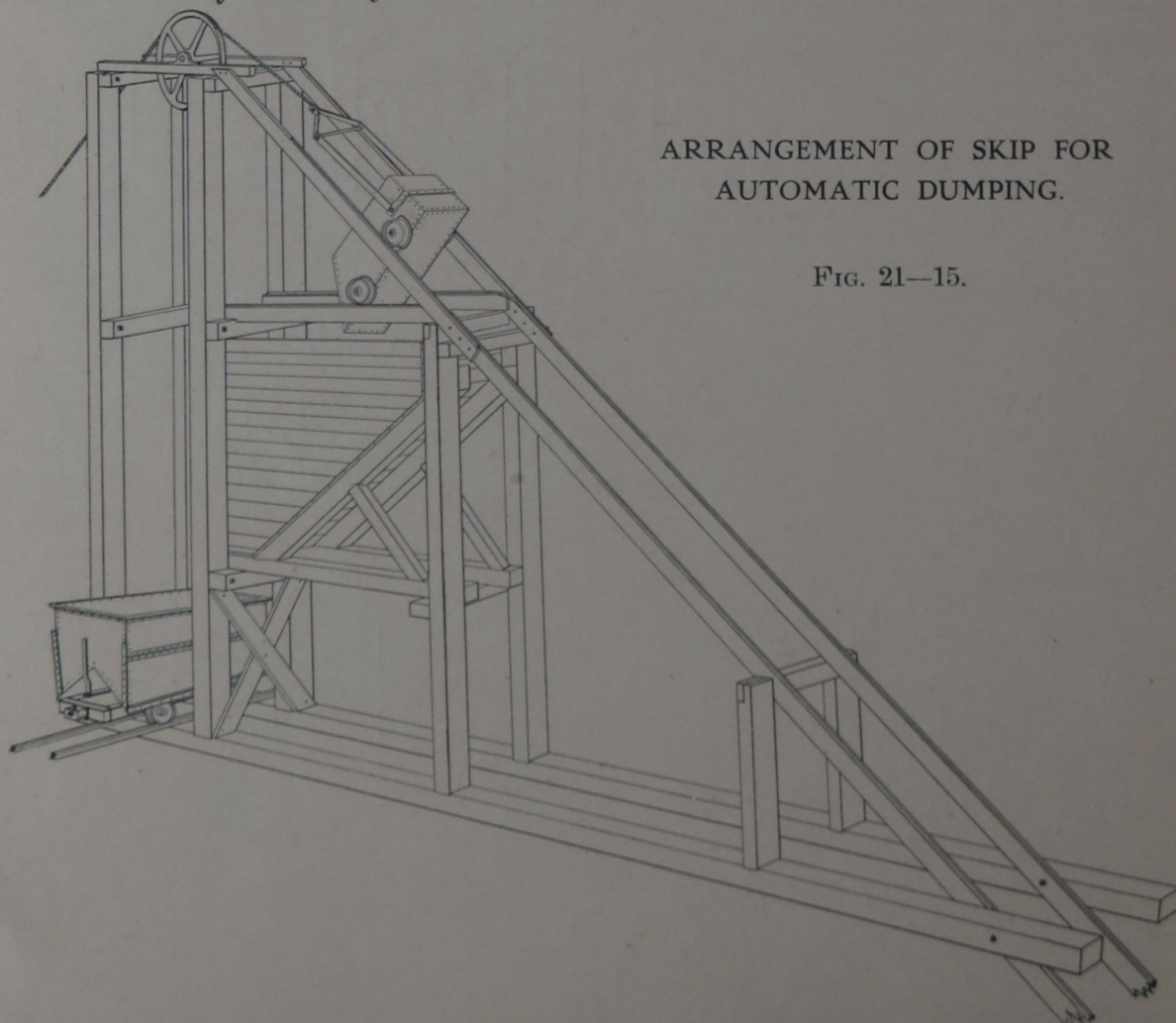
ARRANGEMENT OF SKIP FOR
AUTOMATIC DUMPING.

FIG. 21—15.

SELF-DUMPING SKIP.

For Vertical Shafts.

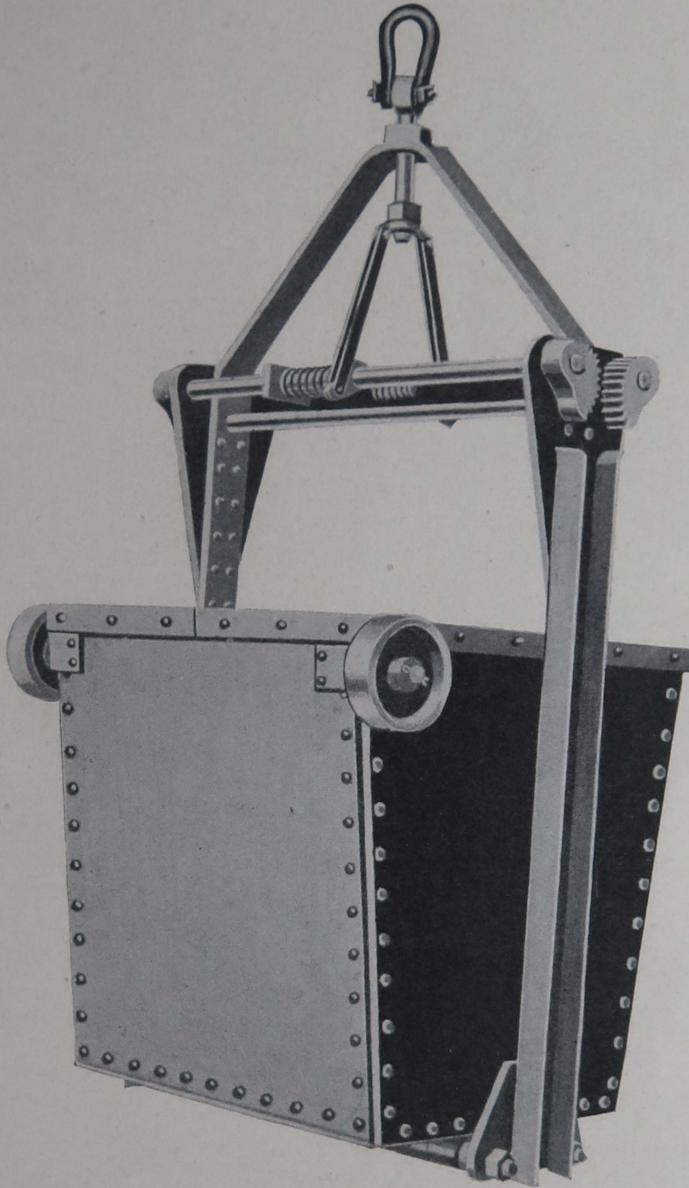


FIG. 22—15.

Much greater tonnage can be raised from mine shafts, both inclined and vertical, by skips, than by ordinary hand-loaded and unloaded cages.

The skip illustrated in Fig. 22 combines the advantages of automatic dumping possessed by skips used in inclined shafts with the safety of the cages used in vertical shafts.

These skips are made almost wholly of Norway iron and steel, the bail and safety device being the same as our hoisting cages.

We build them in sizes to suit requirements.

In writing for price, give dimensions of shaft as per diagram under cages and chairs.

MINING CAGES.



FIG. 23-15.
Standard Type.

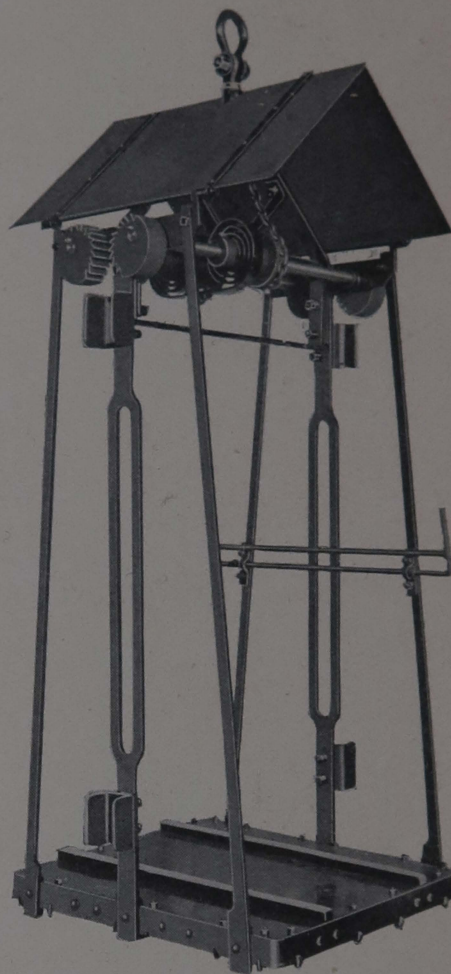


FIG. 24-15.
Leadville Type

Our Standard Mining Cages are built entirely of Norway iron and steel. They are light, stiff and durable. Sizes as given in the table below can be varied several inches without extra cost, each cage being built to fit the shaft.

The Leadville type is built of mild steel and Norway iron. All joints are machined and fastened together with turned steel bolts. No rivets are used. This cage is suitable for extremely severe service.

We build cages of any size or capacity. The list below gives the sizes generally used in Colorado mines.

STANDARD TYPE.

	Size Platform, Feet, About	Capacity, Pounds	Weight, Pounds
Gold or Silver Mines.....	4 x 4	6000	850
Coal Mines.....	4 x 6	6000	1400

LEADVILLE TYPE.

Single Deck .....	.....	.....	1400
Double Deck .....	.....	.....	2000

We make cages for inclined shafts, the platform being always level, no matter what angle the shaft may be.

We also furnish "double-deck" cages for perpendicular shafts.

In requesting prices, give weight to be raised and dimensions in diagram under "Cages and Chairs."

LANDING DOGS.

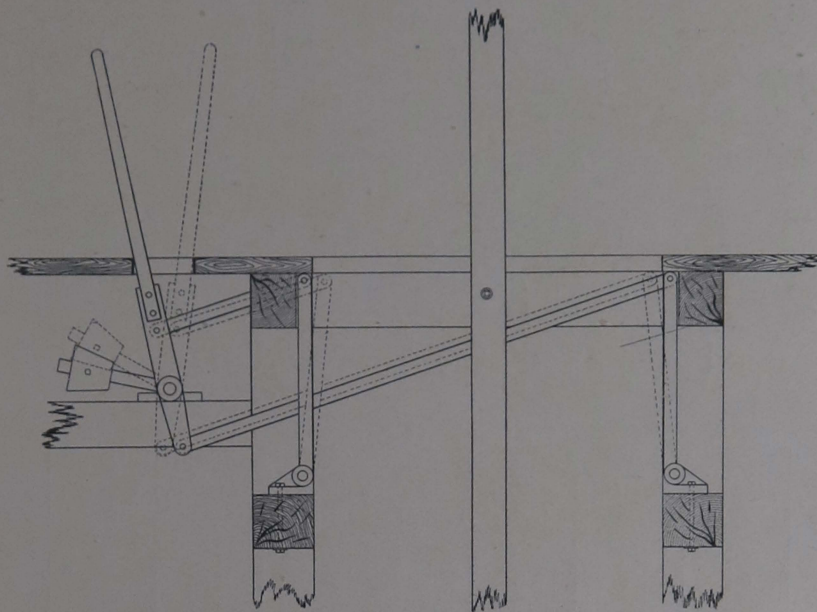


FIG. 25—15.

Made of Norway iron and steel. They are very strong and durable. By means of the weight which is adjustable to either side, the dogs may be held either in or out as desired, unless thrown the other way by the lever.

The cut shows standard Landing Dogs. We make others to order.

CAGES AND CHAIRS.

DIAGRAM FOR ORDERING.

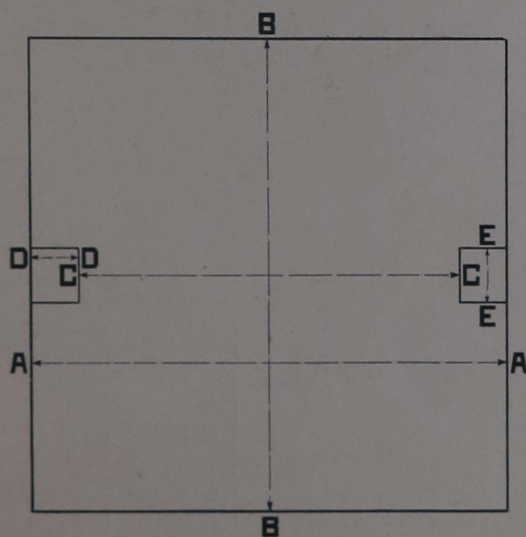
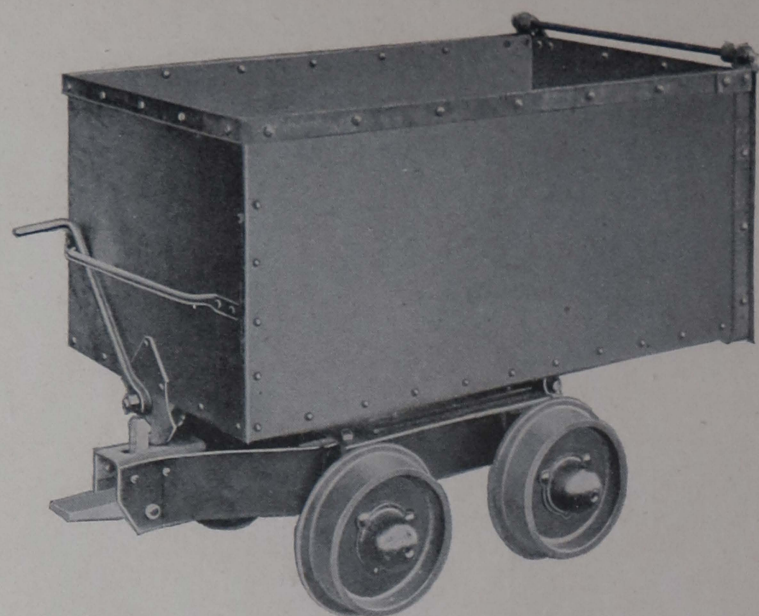


FIG. 26—15.

When ordering cages or chairs (landing dogs), give dimensions of shaft as indicated by diagram. For cages, give all dimensions A-A, B-B, C-C, D-D and E-E. For chairs, only A-A and B-B.



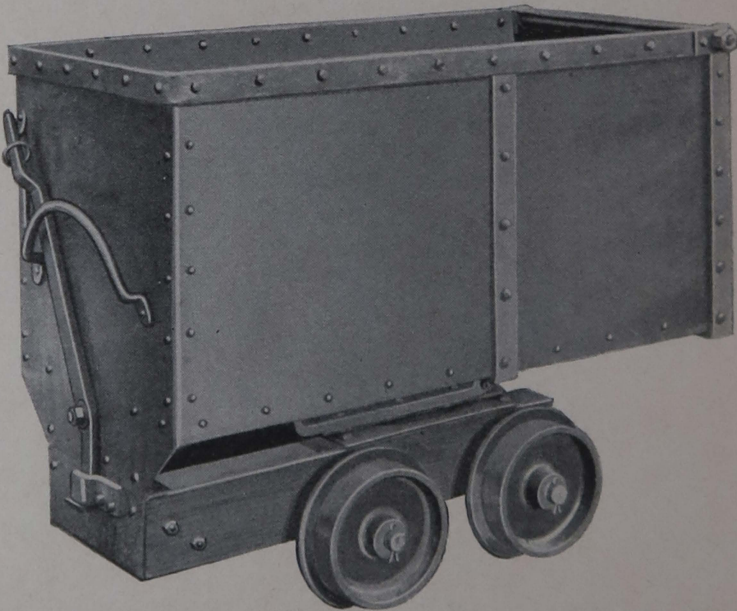
STANDARD ORE CARS.

FIG. 27—15.

Number	Size of Box			Thickness of Steel		Size Axles, In.	Size Wheels, In.	Capacity, Cubic Feet	Weight
	Length, In.	Width, In.	Depth, In.	Sides	Bottom				
1 (ex.) light.....	44	24	20	No. 14	No. 12	1 1/4	10	13	375
2 (light).....	44	24	20	No. 14	No. 12	1 1/4	10	13	410
3 (medium)....	48	24	20	No. 10	No. 8	1 1/4	10	14	510
4 (heavy).....	48	24	20	3/8 in.	1/4 in.	1 1/2	10	14	570
5	48	24	24	3/8 in.	1/4 in.	1 1/2	10	16	610
6.....	48	30	24	1/4 in.	1/4 in.	1 1/2	10	20	750
7.....	54	30	24	1/4 in.	1/4 in.	1 3/4	12	23	950
8.....	60	30	30	1/4 in.	1/4 in.	2	12	27	1100

LEADVILLE ORE CARS.

FIG. 28—15.



No.	Thickness of Steel		Size of Box			Size Axle, In.	Size Wheel, In.	Capacity, Cubic Feet	Weight
	Sides	Bottom	Length, In.	Width, In.	Depth, In.				
1	No. 10	3/8 in.	42	24	24	1 1/2	10	14	650
2	3/8 in.	1/4 in.	42	24	24	1 1/2	10	14	750
3	No. 10	3/8 in.	48	24	24	1 1/2	10	16	800
4	3/8 in.	1/4 in.	48	24	24	1 1/2	10	16	850
5	3/8 in.	1/4 in.	48	30	24	1 3/4	10	20	900
6	3/8 in.	1/4 in.	54	30	24	1 3/4	12	22	950
7	1/4 in.	1/4 in.	54	30	30	2	12	28	1200
8	1/4 in.	1/4 in.	60	30	30	2	12	32	1400

PLATE STEEL TURNING PLATES.

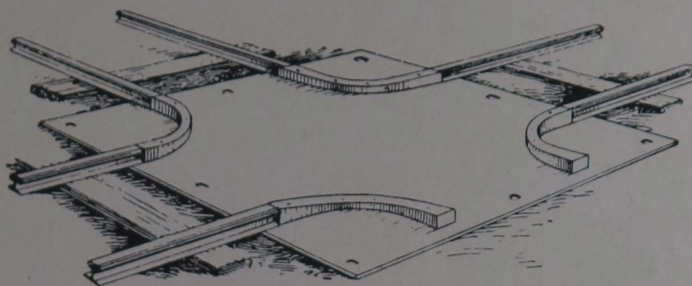


FIG. 29—15.

For turning cars on. Made of $\frac{1}{4}$ -inch steel plate with forged steel points.
In ordering, give size of rail, gauge of track and number of sets of points required.

SWITCHES.

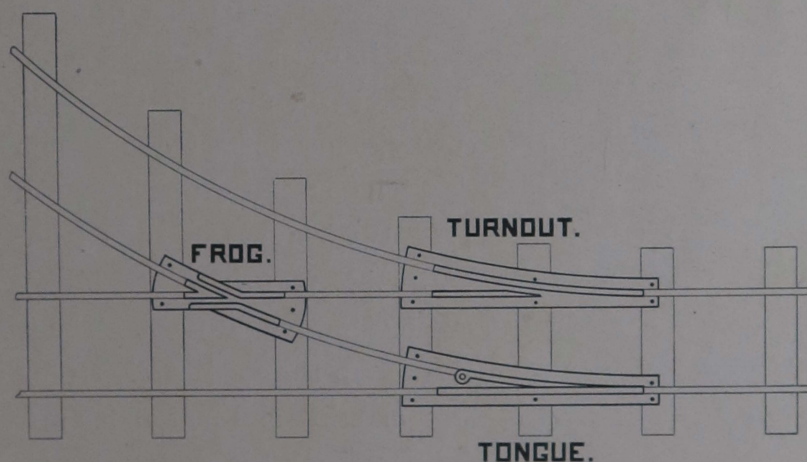


FIG. 30--15.

We carry in stock, Turnouts, Tongues and Frogs suitable for mine switches, as illustrated above, for 8, 10 and 12-pound rail. Radius of curve, 10 feet; gauge of track, 18 inches to 30 inches.

VERTICAL SINKING PUMP.

Outside Packed Plunger Pattern.

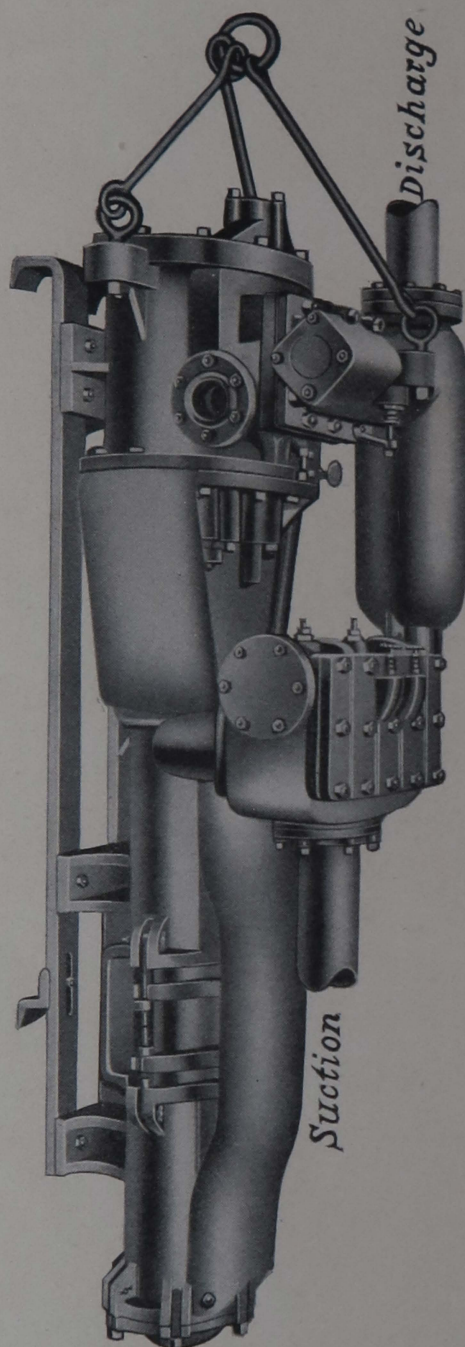


FIG. 31-15.

This Sinking Pump is the Latest and Best
on the Market.

In this type of Pump, (Fig. 31), a hard iron plunger moves in two working-barrels having stuffing boxes and glands fitted with swing bolts for convenience in packing. The valves are of medium hard rubber, with brass seats, bolts and springs, the valve chamber being independent and easily removable for inspection or repairs. The suction valve chamber is fitted with automatic air valves for relieving the pump of air, and the discharge air chamber has a cock for the same purpose. The discharge elbow is fitted with a standard flange and has a cock for drawing off the water in discharge pipe when desired. The bottom flange of the lower working barrel has swing bolts for convenience of removal in order to take out sand or gravel, and the discharge air chamber is in one piece, securing compactness and minimum weight.

The steam cylinder has a recently improved valve gear, without external moving parts, thus reducing the liability to injury from accident or rough usage. The entire design of this pump is exceptionally strong and compact; workmanship and materials are of the best, and fully warranted in every respect.

Diameter of Steam Cylinder	Diameter of Plungers	Stroke	Gallons per Stroke	Capacity per Minute, Gallons	Steam Pipe	Exhaust Pipe	Suction Pipe	Discharge Pipe	Dimensions over all	Shipping Weight, Pounds
7	3 $\frac{1}{2}$	12	.50	50	1	1 $\frac{1}{2}$	2 $\frac{1}{2}$	2	74 x 25 x 27 $\frac{5}{8}$	1245
8	4	12	.65	65	1	1 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{1}{2}$	74 x 25 x 27 $\frac{5}{8}$	1375
10	5	13	1.10	100	1 $\frac{1}{2}$	2	4	3	88 x 28 $\frac{7}{8}$ x 31 $\frac{1}{4}$	1905
14	7	14	2.33	200	2	3	5	4	112 $\frac{3}{8}$ x 38 $\frac{5}{8}$ x 39 $\frac{5}{8}$	4150
16	8	16	3.48	260	2 $\frac{1}{2}$	4	6	5	124 x 44 x 43	5250

PRESSURE PUMPS.

For Mining Purposes.

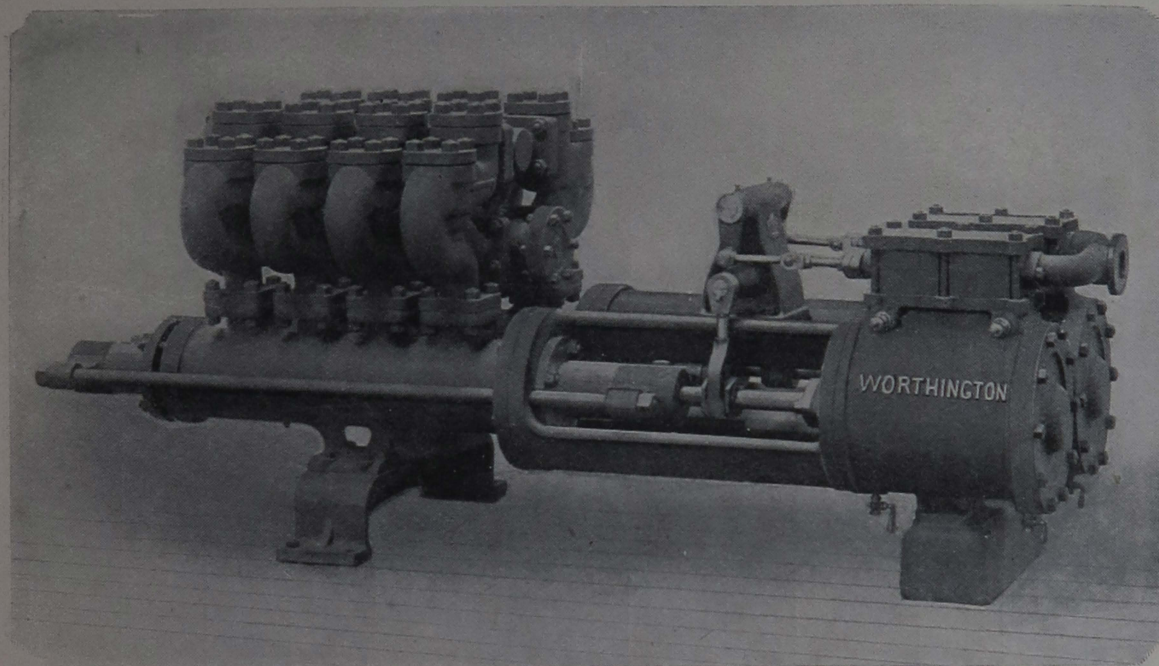


FIG. 32 - 15.

THE WORTHINGTON PRESSURE PUMP.

Outside Packed Plunger Pattern.

Diameter of Steam Cylinders	Diameter of Water Plungers	Length of Stroke	Gallons per Revolution	Revolutions per Minute	Gallons per Minute	Sizes of Pipes for Short Lengths, to be increased as length increases				Approximate Space Occupied, Feet and Inches	
						Steam Pipe	Exhaust Pipe	Suction Pipe	Delivery Pipe	Length	Width
6	3	6	.73	44	32.1	1	1 1/4	2	1 1/2	5 7	2 4
7 1/2	3	6	.73	44	32.1	1 1/2	2	2	1 1/2	5 8	2 4
9	3	6	.73	44	32.1	1 1/2	2	2	1 1/2	5 11	2 4
9	3 3/4	10	1.91	43	82	2	2 1/2	2 1/2	2	9 2	3 2
10	4 1/2	10	2.75	43	118	2	2 1/2	4	3	9 2	3 6
12	4 1/2	10	2.75	43	118	2 1/2	3	4	3	9 6	3 6
14	4 1/2	10	2.75	43	118	2 1/2	3	4	3	9 6	3 6
10	5 1/2	10	4.11	43	176	2	2 1/2	4	3	9 1	3 2
12	5 1/2	10	4.11	43	176	2 1/2	3	4	3	9 8	3 6
14	5 1/2	10	4.11	43	176	2 1/2	3	4	3	9 8	3 6
16	5 1/2	10	4.11	43	176	2 1/2	3	4	3	9 8	3 10
18 1/2	5 1/2	10	4.11	43	176	3	3 1/2	4	3	9 10	4 0
12	6	10	4.89	43	210	2 1/2	3	5	4	9 10	3 7
14	6	10	4.89	43	210	2 1/2	3	5	4	9 10	3 7
16	6	10	4.89	43	210	2 1/2	3	5	4	9 11	3 10
12	7	10	6.66	43	286	2 1/2	3	6	5	9 11	5 2
14	7	10	6.66	43	286	2 1/2	3	6	5	9 11	5 2
16	7	10	6.66	43	286	2 1/2	3	6	5	9 11	5 2
18 1/2	7	10	6.66	43	286	3	3 1/2	6	5	10 0	5 2

PRESSURE PUMPS.

For Mining Purposes

THE KNOWLES PRESSURE PUMP.

Outside Packed Plunger Pattern.

Steam Cylinders	Water Plungers	Stroke	Capacity in Gallons per Stroke, each Plunger	Strokes per Minute, each Plunger	Capacity of Both Cylinders in Gallons, per Minute	Steam Pipe	Exhaust Pipe	Suction Pipe	Discharge Pipe	Water Pressure End will stand, in lbs., per square inch
Ins.	Ins.	Ins.				Ins.	Ins.	Ins.	Ins.	
4 1/2	2	4	.05	100 to 200	10 to 20	1 1/2	3/4	1 1/2	1 1/4	300
4 1/2	2 1/2	4	.08	100 " 200	16 " 32	1 1/2	3/4	2	1 1/2	300
5 1/4	3	5	.15	100 " 200	30 " 60	3/4	1 1/4	2	1 1/2	300
6	3 1/2	6	.25	100 " 150	50 " 75	1	1 1/2	2 1/2	2	300
6	4	6	.33	100 " 150	67 " 100	1	1 1/2	3	2 1/2	300
7 1/2	4	6	.33	100 " 150	67 " 100	1 1/4	1 1/2	3	2 1/2	300
7 1/2	4 1/2	6	.42	100 " 150	85 " 125	1 1/4	1 1/2	4	3	300
7 1/2	5	6	.51	100 " 150	100 " 150	1 1/4	1 1/2	4	3	300
7 1/2	4 1/2	10	.69	50 " 100	69 " 138	1 1/4	1 1/2	4	3	300
7 1/2	5	10	.85	50 " 100	85 " 170	1 1/4	1 1/2	4	3	300
10	4	10	.54	50 " 100	54 " 108	1 1/2	2	4	3	250
10	5	10	.85	50 " 100	85 " 170	1 1/2	2	4	3	250
10	6	10	1.22	50 " 100	122 " 244	1 1/2	2	5	4	250
12	4	12	.65	50 " 100	65 " 130	2 1/2	3	4	3	450
12	5	12	1.02	50 " 100	102 " 204	2 1/2	3	4	3	300
12	6	12	1.47	50 " 100	147 " 294	2 1/2	3	5	4	300
12	7	12	2.00	50 " 100	200 " 400	2 1/2	3	6	5	300
12	7 1/2	12	2.30	50 " 100	230 " 460	2 1/2	3	6	5	300
14	5	12	1.02	50 " 100	102 " 204	2 1/2	3	4	3	300
14	6	12	1.47	50 " 100	147 " 294	2 1/2	3	5	4	300
14	7	12	2.00	50 " 100	260 " 400	2 1/2	3	6	5	300
14	7 1/2	12	2.30	50 " 100	230 " 460	2 1/2	3	6	5	300
14	8	12	2.61	50 " 100	261 " 522	2 1/2	3	7	6	300
16	5	12	1.02	50 " 100	102 " 204	2 1/2	3	4	3	450
16	6	12	1.47	50 " 100	147 " 294	2 1/2	3	5	4	450
16	6	18	2.20	40 " 80	176 " 352	2 1/2	3	6	5	450
16	7	12	2.00	50 " 100	200 " 400	2 1/2	3	6	5	300
16	7 1/2	12	2.30	50 " 100	230 " 460	2 1/2	3	6	5	300
16	7	18	3.00	40 " 80	240 " 480	2 1/2	3	7	6	450
16	7 1/2	18	3.44	40 " 80	275 " 550	2 1/2	3	7	6	450
16	8	12	2.61	50 " 100	261 " 522	2 1/2	3	7	6	300
16	8	18	3.91	40 " 80	312 " 625	2 1/2	3	8	7	450
16	8 5/8	18	4.50	40 " 80	360 " 720	2 1/2	3	8	7	400
16	9	12	3.30	50 " 100	330 " 660	2 1/2	3	8	7	250
16	9	18	4.95	40 " 80	396 " 792	2 1/2	3	8	7	250
18 1/2	7	12	2.00	50 " 100	200 " 400	3	3 1/2	6	5	250
18 1/2	8	12	2.61	50 " 100	261 " 522	3	3 1/2	7	6	250
18 1/2	8	18	3.91	40 " 80	312 " 625	3	3 1/2	8	7	450
18 1/2	9	18	4.95	40 " 80	396 " 792	3	3 1/2	8	7	250
18 1/2	10	18	6.12	40 " 80	490 " 980	3	3 1/2	10	8	250
20	8	18	3.91	40 " 80	312 " 625	4	5	8	7	450
20	9	18	4.95	40 " 80	396 " 792	4	5	8	7	250
20	10	18	6.12	40 " 80	490 " 980	4	5	10	8	250

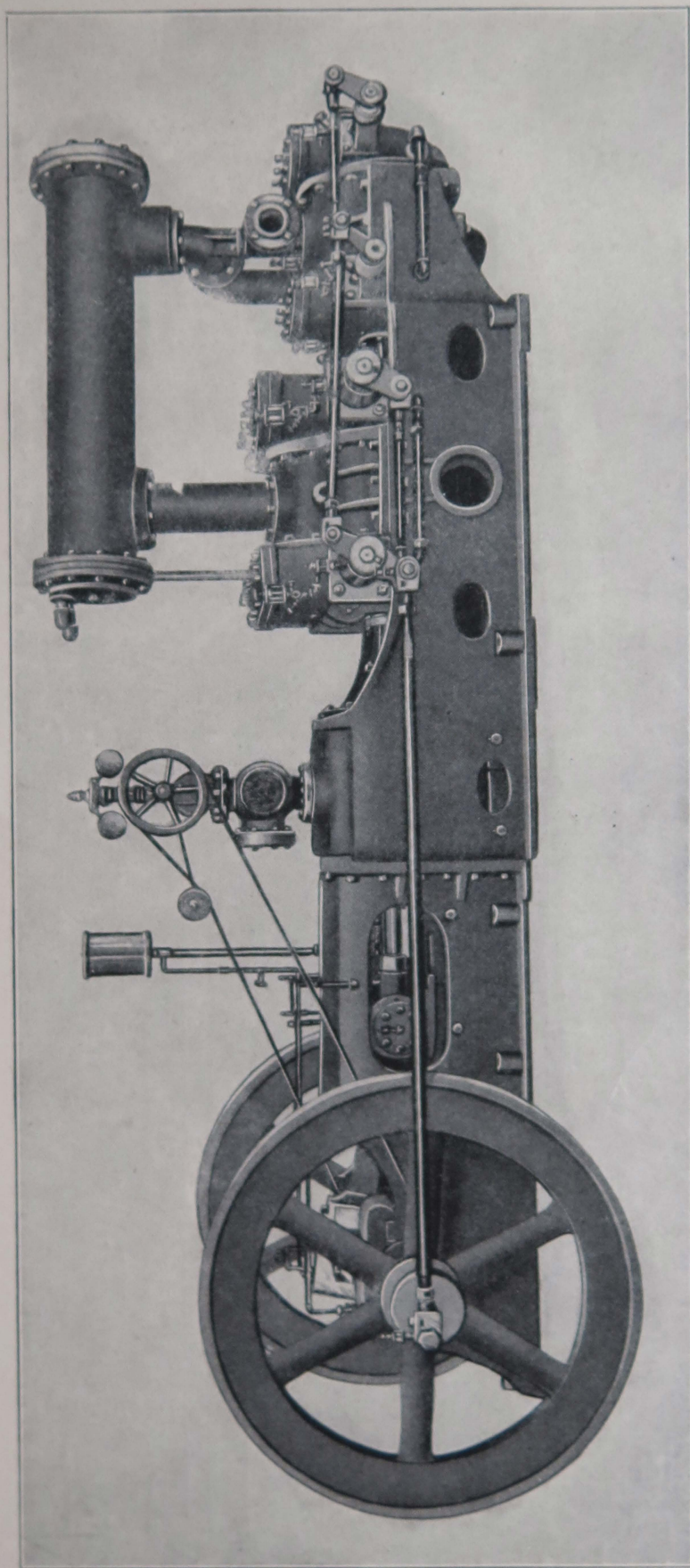


FIG. 33-15.

SINGLE TWO STAGE TANDEM CINCINNATI GEAR COMPRESSOR.

Meyer Steam Valve Gear.

Class 21.

Bed-Plate Type.

THE CINCINNATI STRAIGHT-LINE COMPRESSORS.

Class 21.

SINGLE TWO-STAGE AIR CYLINDERS.

MEYER STEAM VALVE GEAR.

CINCINNATI AIR VALVE GEAR.

Specially designed for operating rock drills. Send for special bulletin giving details of construction.

TABLE OF SIZES AND CAPACITIES.

Equipment: Combination speed and pressure governor, full set of wrenches, backing flanges for main pipe connections, full set of oil cups, steam and air sight feed lubricators and intercooler safety valve

Size in Inches			Revolutions per minute	Piston Speed in feet per minute	Air Piston Displacement in Cubic Feet		Indicated Horse- power at 100 lbs. Air Pressure	Boiler Horsepow- er Req. 1 B. H. P. = 45 lbs. Steam per Hour	Diameter of Pipes in Inches				Floor Space Required	
Steam Cylinder	Air Cylinder	Stroke			Per Revolu- tion	Per Minute			Steam	Exhaust	Discharge	Suction	Length	Width
									Ft.	In.	Ft.	In.		
100 LBS. STEAM PRESSURE.									100 LBS. AIR PRESSURE.					
14	16-10	14	175	410	3.3	575	100	100	4	5	3½	6	17- 0	4-5
16	18-11	16	165	440	4.7	780	135	130	5	6	4	7	18- 6	4-8
18	20-12	18	155	465	6.6	1020	180	150	6	7	4	7	19-11	5-0
20	22-14	20	150	500	8.8	1320	235	180	6	7	4½	8	21- 4	5-5
22	24-15	22	145	530	11.4	1660	290	220	7	8	5	10	23- 0	5-8
70 TO 80 LBS. STEAM PRESSURE.									100 LBS. AIR PRESSURE.					
14	16-10	14	175	410	3.3	575	100	110	5	6	3½	6	17- 0	4-5
18	18-11	16	165	440	4.7	780	135	140	6	7	4	7	18- 6	4-8
20	20-12	18	155	465	6.6	1020	180	160	6	7	4	7	19-11	5-0
22	22-14	20	150	500	8.8	1320	235	190	7	8	4½	8	21- 4	5-5
24	24-15	22	145	530	11.4	1660	290	235	7	8	5	10	23- 0	5-8

HIGH ALTITUDE MACHINES.

100 LBS. STEAM PRESSURE.					For 10,000 Feet Altitude					100 LBS. AIR PRESSURE.				
14	17-10	14	175	410	3.65	640	96	95	4	5	3½	6	17- 0	4-5
16	19-11	16	165	440	5.2	860	130	125	5	6	4	7	18- 6	4-8
18	21-12	18	155	465	7.1	1100	170	145	6	7	4	7	19-11	5-0
20	23-14	20	150	500	9.6	1440	220	175	6	7	4½	8	21- 4	5-5
22	25-15	22	145	530	12.4	1800	270	210	7	8	5	10	23- 0	5-8
70 TO 80 LBS. STEAM PRESSURE.					For 10,000 Feet Altitude					100 LBS. AIR PRESSURE.				
16	17-10	14	175	410	3.65	640	96	105	5	6	3½	6	17- 0	4-5
18	19-11	16	165	440	5.2	860	130	135	6	7	4	7	18- 6	4-8
20	21-12	18	155	465	7.1	1100	170	155	6	7	4	7	19-11	5-0
22	23-14	20	150	500	9.6	1440	220	185	7	8	4½	8	21- 4	5-5
24	25-15	22	145	530	12.4	1800	270	220	7	8	5	10	23- 0	5-8

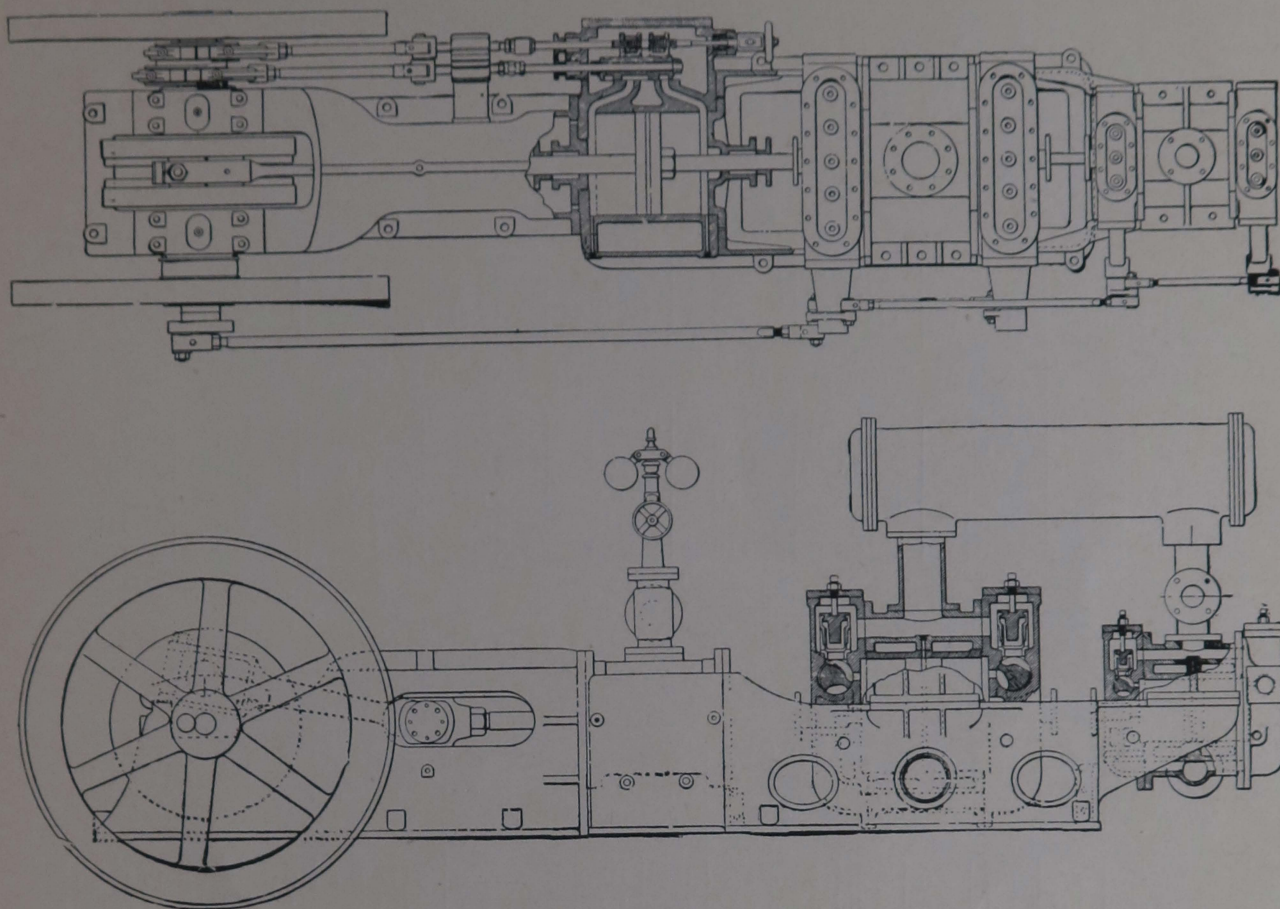


FIG. 34—15.

The air-valve gear has always been the greatest obstacle to even moderate speeds in compressors as compared with ordinary engine speeds.

The Cincinnati Air Valve Gear, shown in Fig. 34, which is the combination of a Corliss semi-rotary valve and a poppet valve, approaches nearer to perfection than any other compressor air valve. This valve positively controls the opening of the suction, the closing of the suction and the closing of the discharge. The opening of the discharge, which is a variable event, is effected by means of poppet valves. At the end of the stroke, the discharge is mechanically closed by means of the Corliss semi-rotary valves, thus retaining under the poppet discharge valves a cushion of air under receiver pressure. These poppet valves are, therefore, given the entire return stroke in which to seat themselves and all tendency to destructive impact in closing is removed.

This mechanical closing of the discharge, combined with the entire freedom of discharge opening afforded by the poppet valves having equal pressure on both sides, is the essential feature of the Cincinnati air-valve gear. By its use, higher speeds and hence greater capacities can be obtained, and the purchaser gets more for his money than if he bought a plain poppet or mechanically moved valve compressor.

AIR REQUIRED FOR ROCK DRILLS.

I. AIR CONSUMPTION AT SEA LEVEL OF STANDARD SIZE ROCK DRILLS.

Size of Cylinder Usual Diam. of Hole Drilled	2 1-1½	2¼ 1½-1½	2½ 1-2	2¾ 1¼-2½	3 1½-3	3⅛ 1½-3	3¼ 1½-3	3½ 1¾-3
Air Pressures	Air Consumption at Sea Level of one Drill—Cubic feet per minute of free air							
60	60	65	70	80	90	100	110	120
70	70	75	80	90	105	115	125	135
80	80	85	90	100	115	130	140	150
90	85	90	95	115	130	140	150	170
100	95	100	110	125	140	155	170	185

II. MULTIPLICATION FACTORS FOR ALTITUDE AND NUMBER OF DRILLS.

Altitude of Plant, Feet above Sea Level	Number of Drills															
	1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30
	Combined Factors															
0	1	1.8	2.6	3.35	4.10	4.8	5.45	6.10	6.75	7.45	8.05	8.7	10.65	13.9	17.1	20.2
1000	1.03	1.85	2.67	3.45	4.25	4.95	5.6	6.3	6.95	7.6	8.3	9	11	14.4	17.6	20.8
2000	1.06	1.91	2.75	3.55	4.35	5.1	5.8	6.5	7.2	7.9	8.5	9.2	11.3	14.7	18.1	21.5
3000	1.09	1.96	2.83	3.65	4.5	5.2	5.95	6.65	7.35	8.1	8.8	9.5	11.6	15.2	18.7	22
4000	1.13	2.03	2.94	3.8	4.6	5.4	6.15	6.9	7.65	8.4	9.1	9.8	12	15.7	19.3	22.8
5000	1.17	2.1	3.04	3.9	4.8	5.6	6.4	7.1	7.9	8.7	9.4	10.2	12.4	16.2	20	23.6
6000	1.21	2.18	3.15	4.06	4.96	5.8	6.6	7.4	8.2	9	9.75	10.6	12.9	16.8	20.7	24.5
7000	1.25	2.25	3.25	4.2	5.15	6	6.8	7.65	8.45	9.3	10	10.9	13.3	17.4	21.5	25.3
8000	1.29	2.32	3.35	4.35	5.3	6.2	7.05	7.9	8.7	9.6	10.4	11.3	13.8	18	22.2	26.1
9000	1.33	2.4	3.47	4.48	5.5	6.4	7.3	8.15	9	9.9	10.7	11.6	14.2	18.6	23	27
10000	1.38	2.5	3.6	4.65	5.7	6.65	7.55	8.45	9.35	10.3	11.2	12.1	14.8	19.3	23.7	28
12000	1.48	2.67	3.86	5.	6.1	7.15	8.1	9.1	10	11	12	13	15.8	20.6	25.5	30

As an example of the use of these rock drill tables, we may assume that an outfit of ten 3-inch drills is projected at an altitude of 9,000 feet, and that it is proposed to carry 70 pounds pressure at the drills. The compressor displacement suitable for such a plant is required.

From Table I we find that one 3-inch drill at sea level uses at 70 pounds pressure the equivalent of 105 cubic feet per minute of free air. In Table II the factor of multiplication for ten drills at 9,000 feet altitude is figured as 9.9. Multiplying 105 by 9.9 gives 1,039.5 cubic feet per minute as the displacement of a compressor suitable, under average conditions, for such a plant.

ROCK DRILL.

Mounted on double screw mining column.

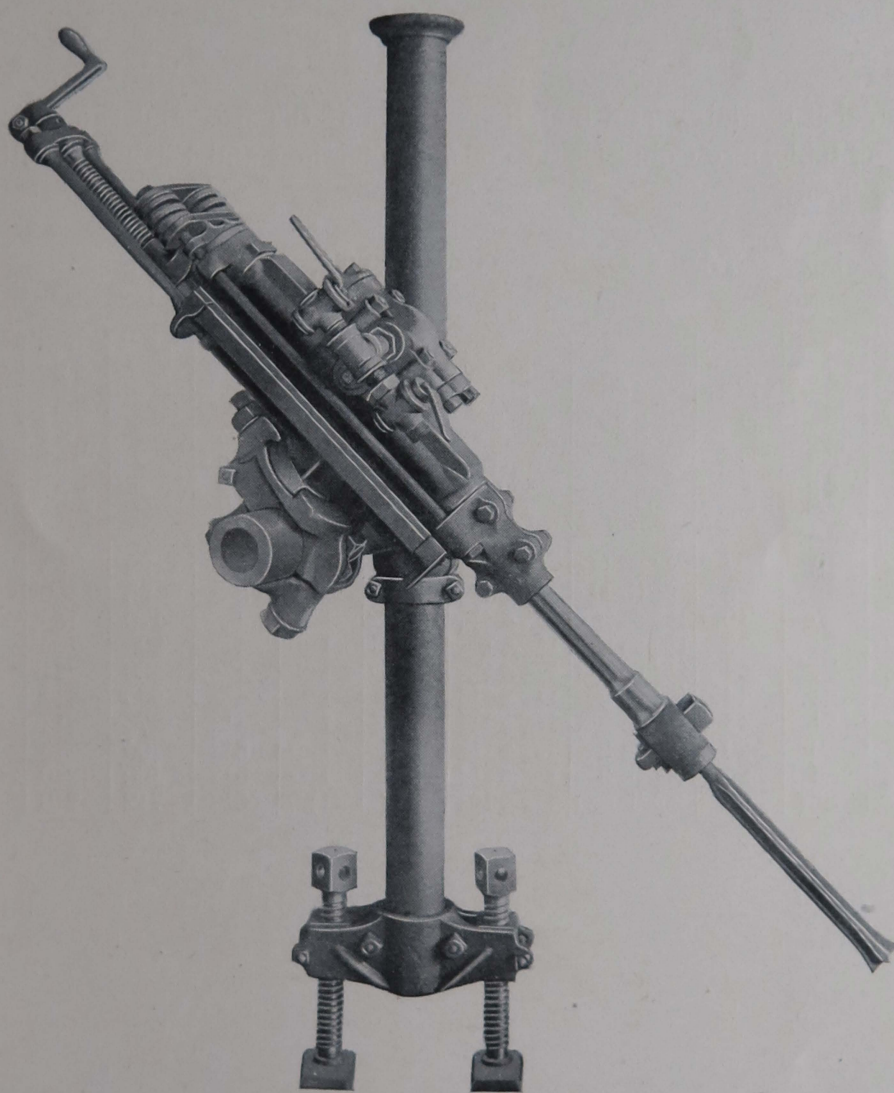


FIG. 35—15.

ROCK DRILLS.

We furnish the latest and best Rock Drills of the sizes and capacities given in the following table, also Columns, Tripods, Connections and Fittings, Drill Steel and Sharpening Tools.

TABLE OF SIZES, CAPACITIES, WEIGHTS.

SIZE		Length of Feed, Inches	Depth Easily Drilled, Feet	Diameter of Hole, Inches	Diameter Drill Steel, Inches	Diameter Steam Inlet, Inches	Size Hose to Connect with Drill, Inches	Size of Column, Inches	Weight of Drill, Unmounted	Weight Single Screw Column, Complete	Weight Double Screw Column, Complete	Weight of Tri- pod and Three Weights
Diameter, Inches	Stroke, Inches											
2	4 $\frac{1}{2}$	12	4	$\frac{3}{4}$ to 1 $\frac{1}{2}$	$\frac{3}{4}$ & $\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	3	88	100	165	250
2 $\frac{1}{4}$	4 $\frac{1}{2}$	12	6	$\frac{3}{4}$ to 1 $\frac{1}{2}$	$\frac{3}{4}$ & $\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	3	93	100	165	250
2 $\frac{1}{2}$	5	20	10	1 $\frac{1}{4}$ to 2	1 & $\frac{5}{8}$	1 or $\frac{3}{4}$	1	4	170	185	320	351
2 $\frac{3}{4}$	6 $\frac{1}{2}$	24	12	1 $\frac{1}{4}$ to 2	1 $\frac{1}{8}$ & 1	1	1	4	200	185	320	387
3	6 $\frac{1}{2}$	24	14	1 $\frac{1}{2}$ to 2 $\frac{1}{4}$	1 $\frac{1}{8}$ & 1	1	1	4 $\frac{1}{2}$	230	214	380	387
3 $\frac{1}{8}$	7	24	14	1 $\frac{3}{4}$ to 2 $\frac{3}{4}$	1 $\frac{1}{4}$ & 1 $\frac{1}{8}$	1	1	4 $\frac{1}{2}$	265	214	380	497
3 $\frac{1}{4}$	7	24	14	1 $\frac{3}{4}$ to 2 $\frac{3}{4}$	1 $\frac{1}{4}$ & 1 $\frac{1}{8}$	1	1	4 $\frac{1}{2}$	275	214	380	497
3 $\frac{1}{2}$	7 $\frac{1}{2}$	30	20	1 $\frac{3}{4}$ to 3	1 $\frac{3}{8}$ & 1 $\frac{1}{4}$	1	1	5 $\frac{1}{2}$	400	240	434	715
3 $\frac{5}{8}$	7 $\frac{1}{2}$	30	25	1 $\frac{3}{4}$ to 3	1 $\frac{3}{8}$ & 1 $\frac{1}{4}$	1	1	5 $\frac{1}{2}$	400	240	434	715
5	8 $\frac{1}{2}$	36	30	3 and larger	1 $\frac{1}{2}$ & 1 $\frac{3}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{2}$	712	240	434	820

BLOWERS AND EXHAUSTERS.

For Ventilating Mines.

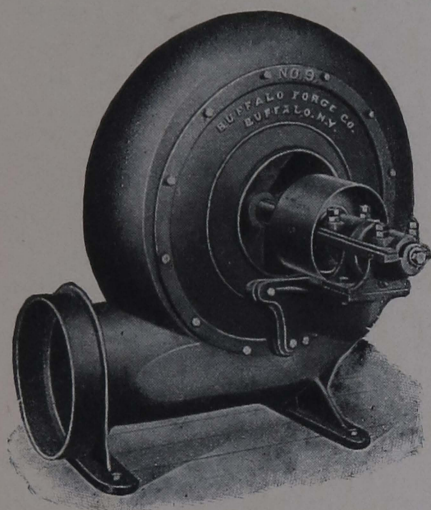


FIG. 36—15.

"B" Volume Blower.

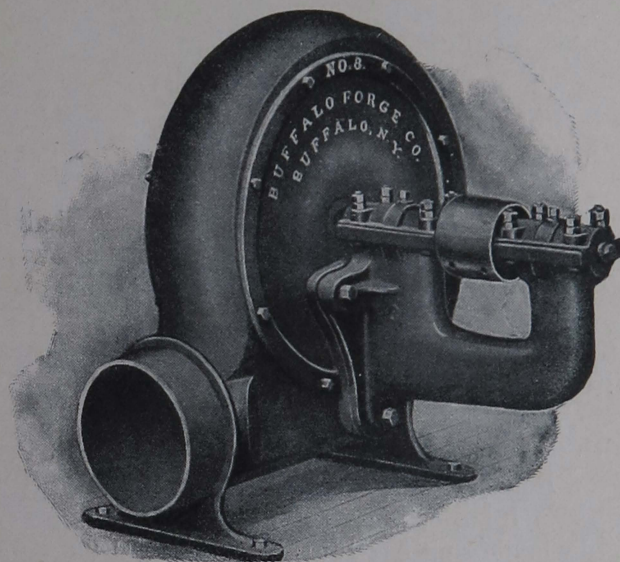


FIG. 37—15.

"B" Volume Exhauster.

Number of Blower	Height, Inches	Diameter of Outlet	Diameter of Pulley	Face of Pulley
000	14 $\frac{3}{4}$	5 $\frac{1}{8}$	2 $\frac{3}{4}$	2 $\frac{1}{4}$
1	15 $\frac{7}{8}$	4 $\frac{7}{8}$	3	2 $\frac{1}{2}$
2	20 $\frac{1}{2}$	6 $\frac{1}{8}$	3 $\frac{1}{4}$	2 $\frac{5}{8}$
3	24 $\frac{1}{2}$	7 $\frac{5}{8}$	4	3 $\frac{1}{4}$
4	27 $\frac{1}{2}$	9	5	4
5	31 $\frac{5}{8}$	10 $\frac{5}{8}$	5 $\frac{3}{4}$	4 $\frac{1}{2}$
6	37 $\frac{1}{8}$	11 $\frac{1}{8}$	6 $\frac{1}{2}$	5 $\frac{1}{2}$
7	42 $\frac{5}{8}$	14	7 $\frac{1}{2}$	6 $\frac{1}{2}$
8	47 $\frac{1}{8}$	16 $\frac{3}{8}$	8 $\frac{1}{2}$	7 $\frac{1}{2}$
9	55 $\frac{1}{8}$	17 $\frac{7}{8}$	9 $\frac{1}{2}$	8 $\frac{1}{2}$
10	68 $\frac{3}{8}$	21	12	10
11	78 $\frac{3}{8}$	24 $\frac{1}{2}$	14	12

We furnish gasoline engines for running these blowers and exhausters.

HORIZONTAL TUBULAR BOILERS.

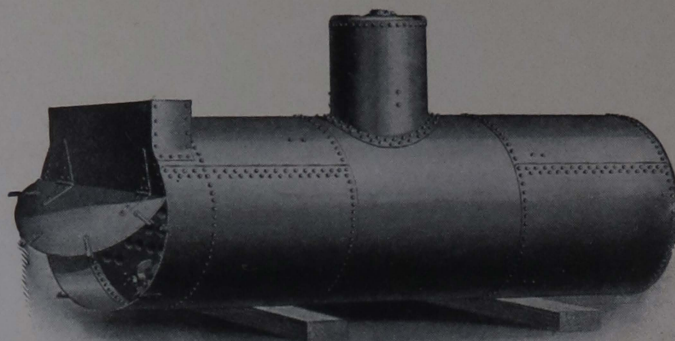


FIG. 38-15.

The Standard Atlas Boilers are carried in stock for immediate shipment. The designs have been approved as the best known after many years studying the requirements of service and experience in manufacturing tens of thousands of boilers.

All plates and heads are of Open Hearth Flange Steel having a tensile strength of 60,000 pounds per square inch of section, with not less than 56 per cent of ductility guaranteed by the makers to bend down double when cold, without fracture.

The tubes are the best American lap welded, set vertically and horizontally, with a clear space of at least one inch between the rows, expanded into neatly chamfered holes, flared outward at front end and beaded down at rear.

Each boiler is thoroughly tested under a cold-water pressure of 150 pounds, after being loaded on car for shipment, and Certificate of Inspection is furnished.

SPECIFICATIONS FOR SINGLE SETTING.

Nominal Rated Horse Power	Shell		Depth of Smoke Box, In.	Thickness of Boiler Plate		Dome		Size of Steam Outlet, In.	Tubes		Total Heating Surface, Sq. Ft.	Total Grate Surface, Sq. Ft.	Stack		Shipping Weight, Pounds, Approximate			
	Diameter, In.	Length, Ft.		Shell, In.	Heads, In.	Diameter, In.	Height, In.		Number	Diameter, In.			Length, Ft.	Diameter, In.	Length, Ft.	Boiler Only	Fix- tures Only	Boiler and Fix- tures
15	36	8	15	1/4	3/8	18	20	2	24	3	8	214	5.83	18	30	2376	1624	4000
20	36	10	15	1/4	3/8	18	20	2	24	3	10	266	8.33	18	30	2785	1715	4500
25	36	12	15	1/4	3/8	18	20	2 1/2	24	3	12	318	9.44	18	35	3129	1971	5100
30	40	12	15	1/4	3/8	20	22	2 1/2	30	3	12	404	11.11	20	40	3727	2273	6000
35	42	12	15	1/4	7/8	20	22	2 1/2	36	3	12	464	12.83	22	40	4151	2349	6500
40	46	12	15	1/4	7/8	24	24	3	42	3	12	491	14.58	22	40	4731	2561	7300
45	48	12	15	3/8	7/8	24	24	3	48	3	12	551	15.28	24	40	5450	2650	8100
50	48	14	15	3/8	7/8	24	24	3	36	3 1/2	14	630	15.98	24	40	6498	2602	9100
55	52	14	15	3/8	7/8	28	26	3 1/2	40	3 1/2	14	693	16.66	26	40	7217	3383	10600
60	54	14	15	1/2	1 1/2	28	26	3 1/2	44	3 1/2	14	721	18.05	26	40	8070	3530	11600
70	54	16	15	1/2	1 1/2	28	26	3 1/2	36	4	16	817	20.83	26	40	9348	3652	13000
75	60	14	15	1/2	1 1/2	32	32	4	54	3 1/2	14	940	21.52	30	40	9750	3950	13700
85	60	16	15	1/2	1 1/2	32	32	4 1/2	44	4	16	1045	22.22	30	40	11053	4047	15100
100	66	16	15	3/8	1 1/2	32	32	4 1/2	54	4	16	1265	24.88	36	40	13807	4993	18800
125	72	16	15	3/8	1 1/2	32	32	5	70	4	16	1578	29.50	40	40	16207	5493	21700
150	72	18	15	3/8	1 1/2	32	32	5	70	4	18	1775	29.50	40	40	17707	5493	23200

Each Boiler is furnished with Dome, Smoke Box Extension, Smoke Head Door and Stack Saddle, Fire Front, Grate Bars, Bearing Bars, Wings, Back Arch Frames, Round Soot Pit Door and Frame, Safety Valve, Steam Gauge and Siphon, Glass Water Gauge and Gauge Cocks, Check Valve, Stop Valve, Blow-Off Cock, Whistle, Smoke Stack and Guys.

Anything ordered other than as specified will be charged for extra.

LOCOMOTIVE BOILERS.

With Water Bottom.

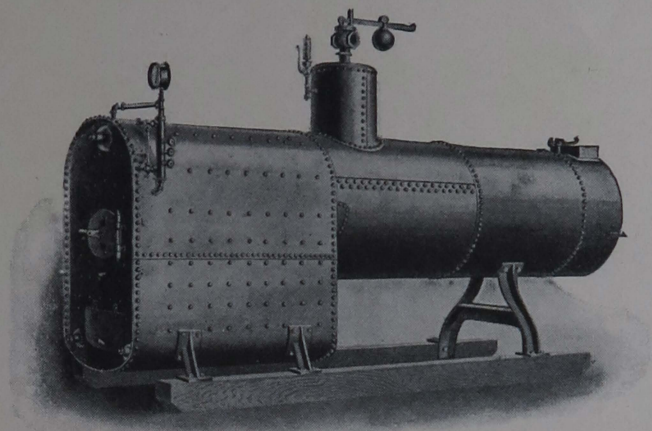


FIG. 39-15.

The illustration shows the Locomotive Boiler with Water Bottom. The makers also build them with Open Bottom and furnish combined under and over outfits on wheels or on skids, with Atlas Self-Contained Engines.

The liberal dimensions of fire box, length of barrel, size, number and arrangement of tubes, all combine to produce better proportions, larger and more efficient surfaces than are usually offered in boilers of this type.

The high quality of plate, tubes, stay bolts, rivets and bracing is rigidly maintained; cost is made secondary to safety and reliability.

Each boiler is designed for a constant working pressure of 100 pounds, and a test of 150 pounds cold-water pressure is applied before shipment.

NOMINAL RATED HORSE POWER	SHELL			FIRE BOX			DOME		TUBES			Total Heating Surface, Sq. Ft.	STACK		SHIPPING WEIGHT, Pounds, Approximate			
	Diameter, In.	Length Over All,		Length, In.	Width, In.	Height, In.	Diameter, In.	Height, In.	Number	Diameter, In.	Length		Diameter, In.	Length, Ft.	Boiler Only	Fixtures Only	Boiler and Fixtures	
		Ft.	In.								Ft.							In.
10	28	9	5	30	23	36	15	16	25	2 1/2	5	6	127	10	15	2754	446	3200
15	32	11	0	42	27	40	15	16	34	2 1/2	6	0	188	12	15	3829	671	4500
20	34	12	8	48	29	45	15	16	40	2 1/2	7	0	251	12	20	4902	798	5700
25	36	14	0	52	32	48	18	20	45	2 1/2	8	0	315	14	25	5832	968	6800
30	40	15	2	54	36	48	20	22	49	2 1/2	9	0	376	18	35	6636	1364	8000
40	42	16	4	54	37	60	20	22	62	2 1/2	10	0	510	20	40	8445	1555	10000

Each Boiler, on Skids, is furnished with Dome, Grate Bars, Safety Valve, Steam Gauge and Siphon, Glass Water Gauge and Gauge Cocks, Check Valve, Stop Valve, Blow-Off Cock, Whistle, Smoke Stack and Guys.

Anything ordered other than as specified above will be charged for extra.

VERTICAL TUBULAR BOILERS.

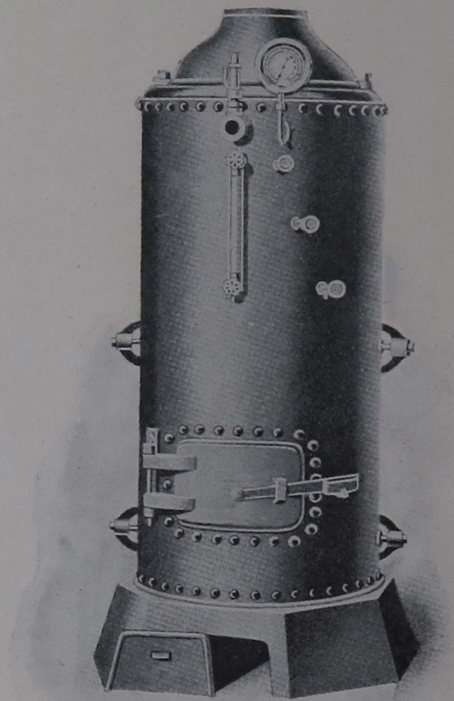


FIG. 40—15.

Horse Power	Size	Thickness		2 Inch Tubes		Heating Surface, Sq. Ft.	Weight, Including Fixtures	Diameter Stack
		Shell	Heads	Number	Length			
4	24 x 4	$\frac{1}{4}$	$\frac{3}{8}$	24	25	39	1300	8
7	30 x 5	$\frac{1}{4}$	$\frac{3}{8}$	42	34	75	1800	10
11	30 x 7	$\frac{1}{4}$	$\frac{3}{8}$	42	58	107	2200	10
12	36 x 6	$\frac{1}{4}$	$\frac{3}{8}$	60	46	134	2300	14
14	36 x 7	$\frac{1}{4}$	$\frac{3}{8}$	60	58	164	2700	14
16	36 x 8	$\frac{1}{4}$	$\frac{3}{8}$	60	70	194	3100	14
20	42 x 7	$\frac{5}{16}$	$\frac{3}{8}$	84	54	219	3700	16
23	42 x 8	$\frac{5}{16}$	$\frac{3}{8}$	84	66	261	4100	16
27	42 x 9	$\frac{5}{16}$	$\frac{3}{8}$	84	78	303	4500	16
30	48 x 8	$\frac{11}{32}$	$\frac{3}{8}$	120	66	363	5400	20
35	48 x 9	$\frac{11}{32}$	$\frac{3}{8}$	120	78	423	5900	20
40	48 x 10	$\frac{11}{32}$	$\frac{3}{8}$	120	90	483	6400	20
50	48 x 12	$\frac{11}{32}$	$\frac{3}{8}$	150	90	600	7000	20

Fixtures furnished are: Base, Grate, Stack, Hood, Steam Gauge, Water Gauge, Gauge Cocks, Safety Valve, Blow-Off Valve, Check and Stop Valve.

PROSPECTORS' "A" OUTFIT.

For 300 feet depth.

- 1—No. 1 Horse Whim.
- 1—24-inch Sheave, shaft and boxes for head frame.
- 300 ft. Steel Hoisting Rope.
 - 1—Safety Hook and Chain for $\frac{1}{2}$ -inch rope.
 - 2—No. 6 Steel Ore Buckets; capacity $4\frac{1}{2}$ cubic feet, 550 pounds of ore.
 - 1—6-inch Mine Gong.
- 325 ft. Bell Rope.
 - 1—No. 2 Standard Steel Ore Car, side and end dump; capacity 13 cubic feet.
- 100 ft. 8-pound Tee Rails.
 - Bolts for wood head frame.
 - 1—Blacksmith's Outfit "A."
 - Mining Tools as follows:
 - 3—Long-Handled Shovels.
 - 6— $4\frac{1}{2}$ lb. Drifting Picks.
- 150 lbs. Drill Steel.
 - 3—Striking Hammers.
 - 1—Man Saw, $4\frac{1}{2}$ ft.
 - 1—Ax.
 - 1—12-inch Screw Wrench.
 - 1—Steel Wheelbarrow.

Price \$280.00

PROSPECTORS' "B" OUTFIT.

- 1—5 $\frac{1}{4}$ -inch by 5-inch "Anaconda" Prospecting Hoist (see page 4).
- 1—24-inch Sheave, shaft and boxes for head frame.
- 550 ft. $\frac{1}{2}$ -inch Steel Hoisting Rope.
- 2—No. 14 Steel Ore Buckets; capacity 7 $\frac{1}{2}$ cubic feet, 900 lbs. ore.
- 1—Safety Hook and Chain for $\frac{1}{2}$ -inch Rope.
- 1—6-inch Mine Gong.
- 525 ft. Bell Rope.
- 1—No. 2 Standard Steel Ore Car, side and end dump; capacity 13 cubic feet.
- 200 ft. 8-pound Tee Rails.
- Bolts for wood head frame.
- 1—36-inch by 6 feet (12 H. P.) Vertical Boiler, with all fixtures and stack, whistle and injector attached.
- Steam Piping, Valves and Fittings to connect boiler with hoist.
- 1—4 ft. by 6 ft. Wood Water Tank, 660 gals.
- 1—Blacksmith's Outfit "B."
- Mining Tools as follows:
 - 6—Long-Handled Shovels.
 - 12—4 $\frac{1}{2}$ lb. Drifting Picks.
- 300 lbs. Drill Steel.
- 6—Striking Hammers.
- 1—Man Saw, 4 $\frac{1}{2}$ ft.
- 1—Ax.
- 2—Steel Wheelbarrows.

Price \$700.00.

PROSPECTORS' "C" OUTFIT.

- 1—6½-inch by 8-inch Double Cylinder, Single Drum Geared Hoist. Complete with all fixtures as described on page 7. Size rope ¾-inch. Capacity of drum 1,200 ft. rope. Load, 2,300 pounds. Speed, 300 ft. per minute.
- 1—36-inch Sheave, shaft and boxes for head frame.
- 800 ft. ¾-inch Steel Hoisting Rope.
- 1—Safety Hook and Chain for ¾-inch Rope.
- 2—No. 5 Steel Ore Buckets; capacity 11 cubic feet, 1,300 pounds ore.
- 1—8-inch Mipe Gong.
- 750 ft. Bell Rope.
- 1—No. 2 Standard Steel Ore Car, side and end dump; capacity 13 cubic feet.
- 300 ft. 8-pound Tee Rail.
- Bolts for wood head frame.
- 1—36-inch by 12 ft. (25 H. P.) Horizontal Tubular Boiler with Fixtures, Stack, Binders, Whistle and two Injectors attached.
- Steam Piping, Valves and Fittings to connect boiler with hoist.
- 1—6 ft. by 7 ft. Wood Water Tank, 1,400 gals.
- 1—Blacksmith's Outfit "B."
- 9—Long-Handled Shovels.
- 18—4½ lbs. Drifting Picks.
- 500 lbs. Drill Steel.
- 9—Striking Hammers.
- 1—Man Saw, 4½ ft.
- 1—Ax.
- 3—Steel Wheelbarrows.

Price \$1,260.00.

BLACKSMITHS' OUTFIT "A."

The following Blacksmith Outfit is suitable for sharpening drills, picks and other work required in sinking shafts, etc.:

- | | |
|-------------------------------|--------------------------------|
| 1—100 lb. Anvil. | 1— $\frac{3}{8}$ -inch Fuller. |
| 1—30-inch Bellows and Tuyere. | 1—Hardie. |
| 1—10 lb. Sledge. | 1— $\frac{5}{8}$ -inch Swage. |
| 1—Blacksmith's Hammer. | 1—2-inch Flatter. |
| 1—Drill Sharpening Hammer. | 1—Hot Chisel. |
| 1—Tongs for Drills. | 1—Cold Chisel. |
| 1—Tongs for Picks. | |
| 1—Close Tongs. | |

Price \$40.00.

BLACKSMITHS' OUTFIT "B."

- | | |
|--|--|
| 1—175 lb. Anvil. | 2—Round Punches $\frac{3}{8}$ -inch and $\frac{1}{2}$ -inch. |
| 1—40-inch Bellows. | 1—Half Round Heading Tool. |
| 1—Tuyere Iron. | 1—Half Square Heading Tool. |
| 1—No. 1 Riveting Hammer. | 2—Hardies. |
| 1—No. 3 Blacksmith's Striking Hammer. | 6—Pairs Assorted Tongs. |
| 2—Steel Sledges, 8 and 12 lbs. | 1—Combination Pipe Vise. |
| 1—Swage Block $4\frac{1}{2}$ -inch by 18-inch by 18-inch. | 1—Set Bolt and Tap Dies $\frac{1}{4}$ -inch to 1-inch. |
| 1—Set Top and Bottom Swages $\frac{3}{8}$ -inch to $1\frac{1}{2}$ -inch. | 1—Set Pipe Stocks and Dies $\frac{1}{4}$ -inch to 3-inch. |
| 2—Square Flatters. | 1—Set Pipe Cutters $\frac{1}{4}$ -inch to 3-inch. |
| 2—Round Flatters. | 1—12-inch Coe's Screw Wrench. |
| 1—Set Hammer. | 1—Pipe Wrench. |
| 2—Hot Cutters. | 1—Draw Knife. |
| 2—Cold Cutters. | Files, assorted. |
| | 1—Machinist's Hammer. |

Price \$120.00.

OUR RECENT BULLETINS.

- No. 6—No. 5 WILFLEY CONCENTRATOR.
- No. 7—DE REMER WATER WHEELS.
- No. 8—No. 2 WILFLEY SLIME TABLE.
- No. 9—SPECIAL CENTRIFUGAL SAND PUMPS.
- No. 10—DRILL SHARPENING AND FORGING MACHINE.
- No. 11—COPPER CONVERTING MACHINERY.
- No. 12—SMELTING MACHINERY.
- No. 13—ORE REDUCTION MACHINERY.
- No. 14—STAMP MILLS AND CYANIDE PROCESS.
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